

# **Green Bay Sediment Results from July 2002 Survey**

**Green Bay,  
Wisconsin**

**Prepared by:**

**The RETEC Group, Inc.  
22 N. Carroll Street, Suite 370  
Madison, Wisconsin 53703**

**RETEC Project Number: WISC1-16040-100**

**Prepared for:**

**Wisconsin Department of Natural Resources  
101 South Webster Street  
Madison, Wisconsin 53707**

**U.S. Environmental Protection Agency  
Region V Superfund  
77 West Jackson Boulevard  
Chicago, Illinois 60604**



**December 2002**

# **Green Bay Sediment Results from July 2002 Survey**

## **Green Bay, Wisconsin**

**Prepared by:**

**The RETEC Group, Inc.  
22 N. Carroll Street, Suite 370  
Madison, Wisconsin 53703**

**RETEC Project Number: WISC1-16040-100**

**Prepared for:**

**Wisconsin Department of Natural Resources  
101 South Webster Street  
Madison, Wisconsin 53707**

**U.S. Environmental Protection Agency  
Region V Superfund  
77 West Jackson Boulevard  
Chicago, Illinois 60604**

**Prepared by:**

---

**Robert L. Paulson, Senior Scientist**

**Reviewed by:**

---

**Frederick M. Swed, Jr., P.E., Senior Engineer**

**December 2002**

# **Table of Contents**

---

1	Introduction.....	1-1
2	Sampling and Analytical Methods.....	2-1
3	RESULTS .....	3-1

Appendix A	Quality assurance Plan Addendum
Appendix B	Sediment Core Logs and Photos
Appendix C	Data Validation Report
Appendix D	CQM Report

## **List of Figures**

Figure 1 Proposal and Actual Sediment Core Sampling Locations

Figure 2 Green Bay Sediment Core PCB Concentrations

## **List of Tables**

Table 1 Green Bay Sediment Sampling Stations – July 2002

Table 2 PCB, Total Organic Carbon and Percent Solids Results for Green Bay Sediment – July 2002

Table 3 Bulk Density Results for Green Bay Sediment – July 2002

# 1 Introduction

Prior to construction of the confined disposal facility (CDF) Renard Island, in Lake Michigan's Green Bay, open water disposal of navigational dredge spoils often occurred. Historically, several locations in Green Bay were used as disposal sites. The volume and exact location of sediment generated by navigational dredging disposed of in this manner is unknown. However, since open water disposal was in practice at the same time PCBs were being discharged into the Lower Fox River, it is likely these dredge spoils also carried PCB.

During the public comment period following the release of the Proposed Remedial Action Plan – Lower Fox River and Green Bay (PRAP, WDNR 2001) concerns were raised about potential elevated levels (hotspots) of PCB in Green Bay. PCB mapping did indicate several areas with elevated PCB levels. Regrettably, there were few data points in the southern end of Green Bay and thus some of these potential hotspot areas were mapped on the basis of only a single data point. In December 2001, the Fox River Group collected a series of sediment samples in the southern end of Green Bay in an attempt to address this lack of data. Unfortunately, the open water disposal sites were not adequately sampled to determine if elevated levels of PCB were still associated with the historic open water disposal sites.

In July, 2002, WDNR contracted RETEC to conduct a limited sediment survey of Green Bay including historic open water disposal sites. There are two principal objectives for the additional Green Bay sediment analyses:

- ***To more thoroughly characterize areas of Green Bay associated with historic open water dredge disposal areas and navigation channel side casts.*** While the Fox River Database (FRDB) contains a substantial number of data points throughout Green Bay, their locations are not adequate to characterize the open water disposal areas.
- ***To provide additional sediment characterization of the extreme southern end of Green Bay.*** Data will be collected to support WDNR and EPA in responding to the concerns raised during the public comment period for the PRAP about apparent hotspots in Green Bay.

## **2 Sampling and Analytical Methods**

Sample stations were identified in cooperation with US EPA FIELDS and WDNR. Coordinates for each of the stations were identified using WTM NAD 83 (Central Zone) and entered into a Trimble AG132 Submeter DGPS that provided position information coupled with a helmsman's display screen for positioning.

Sediment samples were collected using WDNR's manual push coring technique (RETEC 1998). Where water depth allowed, divers assisted with core penetration and retrieval. At diver-assisted stations, surface sediment disruption was avoided by completing core tube positioning and initial penetration before the diver descended to the sediment surface. Prior to coring, water depth and sediment thickness measurements were taken and recorded

Sediment cores were transferred to a shore based processing location for sectioning and sample acquisition. Sediment cores were either split longitudinally using a circular saw or push-extruded using a rubber stopper through the end of the core tube. Length of total penetration was recorded in the field, and sample recovery lengths were recorded following core extrusion. Total compaction was calculated using these values to estimate in-situ depths.

Independent data validation was conducted by the MA Kuehl Co. Validation was conducted according to the project specific requirements outlined in: Addendum to Quality Assurance Project Plan for Supplemental Data Collection Fox River RI/FS for Green Bay Sediment Analyses (AppendixA).

## **3 RESULTS**

RETEC, with the assistance of Superior Special Services, collected sediment cores from Green Bay between July 22 and July 24, 2002.

Due to wind and wave conditions, exact positioning was impracticable. Table 1 includes the coordinates of the actual position of the sample location. Two sample stations, GB02-13 and GB02-19 were initially located in the navigation channel. These two samples were relocated to outside of the navigation channel (Figure 1). One location, GB02-35 was inaccessible due to shallow water.

Sediment samples were successfully collected at 97% (36 of the 37) of planned stations in Green Bay (Figure 1). At two stations, GB02-01 and GB02-21, duplicate cores were collected within approximately 2 feet of the initial core location. Core logs are provided in Appendix B.

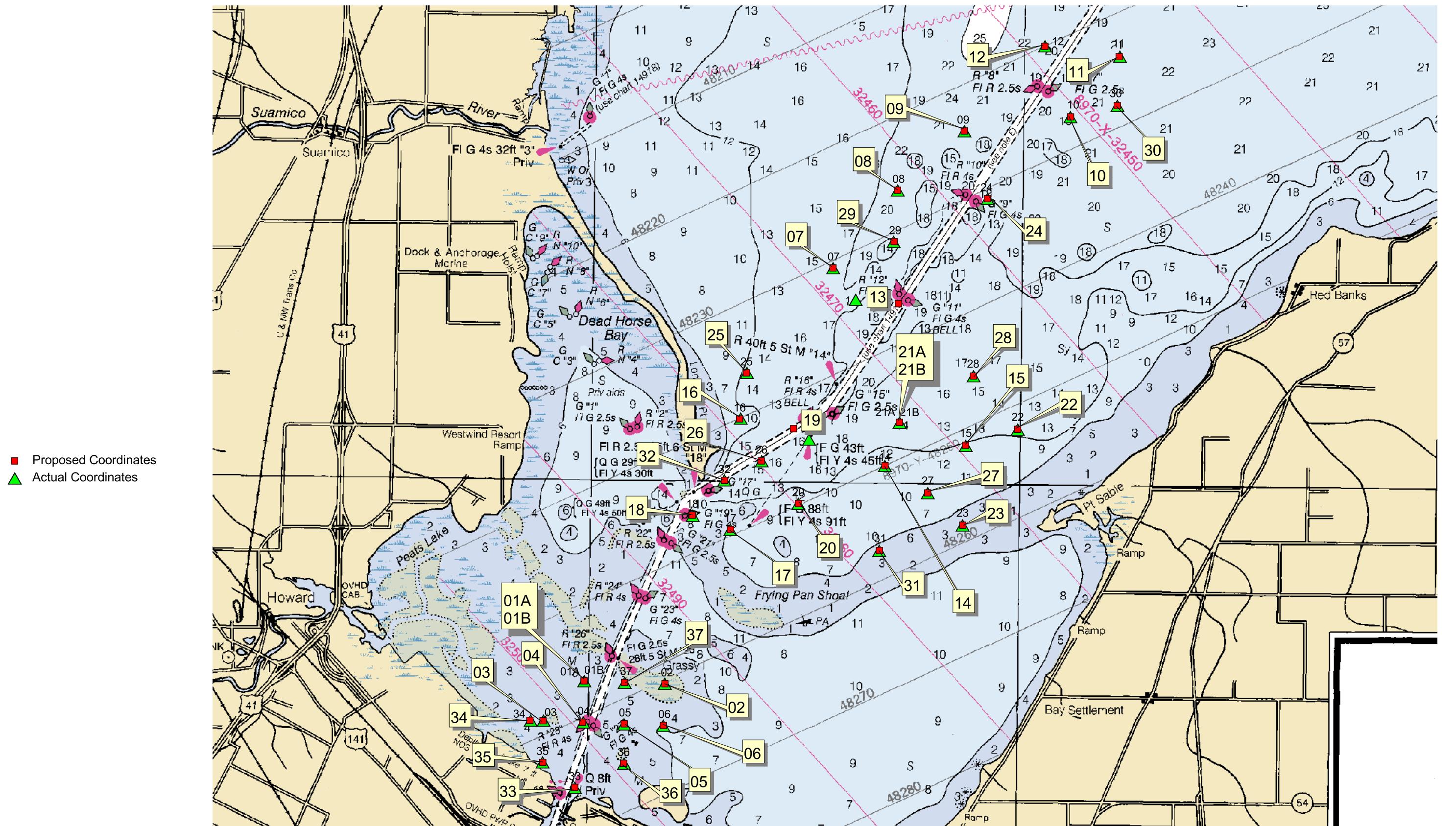
Table 2 contains validated PCB and TOC data for each sample collected. Total PCB data are also plotted on Figure 2. Following data validation, all data were found to be usable as qualified and no PCB or TOC data were rejected. The complete data validation report and validated data sheets for the PCB and TOC analyses are included in Appendix C.

Table 3 contains bulk density data for each sample collected. Data reports from CQM, Inc. are attached as Appendix D. As identified by CQM, results from two samples appear to be outliers. Upon reviewing sample collection and processing procedures, these results remain unexplained and therefore should not be used.

## **List of Figures**

**Figure 1   Proposal and Actual Sediment Core Sampling Locations**

**Figure 2   Green Bay Sediment Core PCB Concentrations**



2000 0 2000 4000 Feet

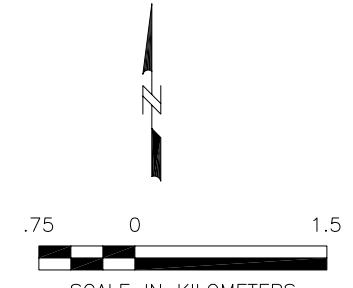
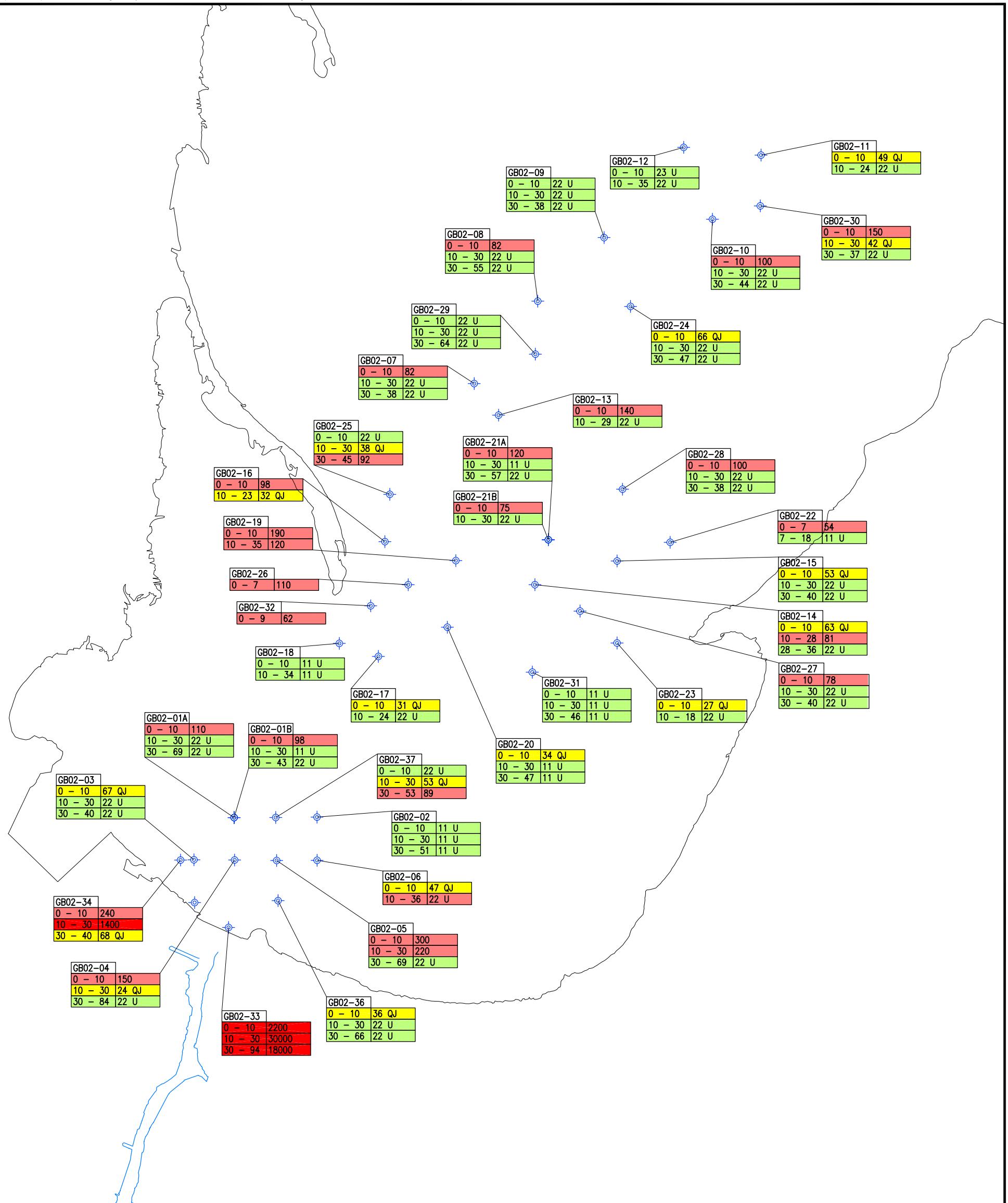
GREEN BAY, WISCONSIN  
WISCN-16040-100

PROPOSED AND ACTUAL SEDIMENT  
CORE SAMPLING LOCATIONS

DATE: 10/11/02 DRWN: SCJ FILE: paulson.apr

LAYOUT NAME: CoordsChart

FIGURE 1



## **List of Tables**

**Table 1    Green Bay Sediment Sampling Stations – July 2002**

**Table 2    PCB, Total Organic Carbon and Percent Solids  
Results for Green Bay Sediment – July 2002**

**Table 3    Bulk Density Results for Green Bay Sediment –  
July 2002**



**Table 1 Green Bay Sediment Sampling Stations, July 2002.**

Station ID	Sample Date	Sample Time	Station Location (WTM NAD 83)				Water Depth (ft)	
			Planned		Actual			
			Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)		
GB02-01	07/23/02	1030	2489528	269513	2489523	269512	6.5	
GB02-02	07/24/02	1015	2493628	269514	2493606	269534	2.0	
GB02-03	07/22/02	1115	2487530	267414	2487544	267433	3.4	
GB02-04	07/22/02	1140	2489527	267414	2489548	267423	7.8	
GB02-05	07/22/02	1630	2491630	267414	2491618	267399	10.4	
GB02-06	07/23/02	0930	2493627	267414	2493610	267408	8.2	
GB02-07	07/24/02	1530	2501347	290889	2501347	290880	18.5	
GB02-08	07/24/02	1610	2504478	294935	2504478	294937	23.0	
GB02-09	07/24/02	1650	2507739	298067	2507745	298068	21.0	
GB02-10	07/24/02	1710	2513089	298980	2513083	298970	21.8	
GB02-11	07/22/02	1410	2515437	302112	2515476	302129	22.0	
GB02-12	07/22/02	1330	2511653	302503	2511665	302509	21.5	
GB02-13	07/24/02	1515	2504739	289193	2502549	289325	20.0	
GB02-14	07/24/02	1220	2504349	280973	2504341	280975	13.5	
GB02-15	07/24/02	1305	2508394	282147	2508386	282145	16.5	
GB02-16	07/22/02	1510	2496911	283060	2496950	283097	14.0	
GB02-17	07/23/02	1225	2496651	277449	2496629	277446	8.4	
GB02-18	07/23/02	1205	2494693	278101	2494704	278088	8.7	
GB02-19	07/24/02	0925	2499651	282668	2500443	282165	19.1	
GB02-20	07/24/02	0950	2500043	278884	2500025	278884	16.0	
GB02-21	07/24/02	1235	2505001	283191	2504998	283191	15.8	
GB02-22	07/24/02	1325	2511003	283061	2510999	283064	14.5	
GB02-23	07/24/02	1150	2508394	278102	2508387	278105	4.0	
GB02-24	07/24/02	1630	2509044	294674	2509047	294678	21.0	
GB02-25	07/22/02	1445	2497172	285408	2497190	285427	13.0	
GB02-26	07/24/02	0857	2498085	280972	2498097	280976	19.0	
GB02-27	07/24/02	1205	2506567	279668	2506564	279676	12.5	
GB02-28	07/24/02	1340	2508654	285671	2508654	285679	14.2	
GB02-29	07/24/02	1550	2504397	292325	2504360	292327	18.5	
GB02-30	07/24/02	1720	2515438	299633	2515438	299627	21.5	
GB02-31	07/24/02	1130	2504219	276667	2504213	276668	7.5	
GB02-32	07/24/02	0835	2496259	279928	2496250	279937	16.1	
GB02-33	07/22/02	1015	2489257	264102	2489249	264101	9.2	
GB02-34	07/22/02	1100	2486862	267413	2486885	267420	3.4	
GB02-35	07/22/02	1040	2487582	265314	2487576	265327	2.0	
GB02-36	07/22/02	1605	2491682	265413	2491688	265422	3.2	
GB02-37	07/23/02	0955	2491577	269513	2491573	269516	3.2	

**Table 2 PCB, Total Organic Carbon and Percent Solids Results for Green Bay Sediment, July 2002.**

STATION ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								Total Organic Carbon (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-01A-0010	0	10	73.5	22U	22U	22U	110	22U	22U	22U	110	8000J
GB02-01A-1030	10	30	59.4	22U	22U	22U	22U	22U	22U	22U	22U	14000J
GB02-01A-3069	30	69	50.4	22U	22U	22U	22U	22U	22U	22U	22U	17000
GB02-01B-0010	0	10	71.4	22U	22U	22U	98	22U	22U	22U	98	7900J
GB02-01B-1030	10	30	59.3	11U	11U	11U	11U	11U	11U	11U	11U	12000J
GB02-01B-3043	30	43	58	22U	22U	22U	22U	22U	22U	22U	22U	19000
GB02-02-0010	0	10	82.7	11U	11U	11U	11U	11U	11U	11U	11U	1800J
GB02-02-1030	10	30	80.7	11U	11U	11U	11U	11U	11U	11U	11U	2100J
GB02-02-3051	30	51	82.1	11U	11U	11U	11U	11U	11U	11U	11U	1300
GB02-03-0010	0	10	83.2	22U	22U	22U	67QJ	22U	22U	22U	67QJ	1300J
GB02-03-1030	10	30	81.6	22U	22U	22U	22U	22U	22U	22U	22U	3300J
GB02-03-3040	30	40	69.2	22U	22U	22U	22U	22U	22U	22U	22U	20000
GB02-04-0010	0	10	51.2	23U	23U	23U	150	23U	23U	23U	150	24000
GB02-04-1030	10	30	47.4	23U	23U	23U	24QJ	23U	23U	23U	24QJ	20000J
GB02-04-3084	30	84	80.2	22U	22U	22U	22U	22U	22U	22U	22U	3000J
GB02-05-0010	0	10	58.7	22U	22U	22U	260	22U	36QJ	22U	300	14000
GB02-05-1030	10	30	59.1	22U	22U	22U	200	22U	24QJ	22U	220	13000
GB02-05-3069	30	69	71	22U	22U	22U	22U	22U	22U	22U	22U	12000
GB02-06-0010	0	10	71.2	22U	22U	22U	47QJ	22U	22U	22U	47QJ	14000
GB02-06-1036	10	36	74	22U	22U	22U	22U	22U	22U	22U	22U	9100J
GB02-07-0010	0	10	59.8	22U	22U	22U	82	22U	22U	22U	82	9100J
GB02-07-1030	10	30	76.3	22U	22U	22U	22U	22U	22U	22U	22U	4900
GB02-07-3038	30	38	75.1	22U	22U	22U	22U	22U	22U	22U	22U	7400J
GB02-08-0010	0	10	62.5	22U	22U	22U	82	22U	22U	22U	82	7100
GB02-08-1030	10	30	78.3	22U	22U	22U	22U	22U	22U	22U	22U	1500J
GB02-08-3055	30	55	82.2	22U	22U	22U	22U	22U	22U	22U	22U	760J
GB02-09-0010	0	10	79.2	22U	22U	22U	22U	22U	22U	22U	22U	2000
GB02-09-1030	10	30	77	22U	22U	22U	22U	22U	22U	22U	22U	2900J
GB02-09-3038	30	38	77.2	22U	22U	22U	22U	22U	22U	22U	22U	5000
GB02-10-0010	0	10	70	22U	22U	22U	100	22U	22U	22U	100	4000J
GB02-10-1030	10	30	80.4	22U	22U	22U	22U	22U	22U	22U	22U	2700J
GB02-10-3044	30	44	79	22U	22U	22U	22U	22U	22U	22U	22U	4900
GB02-11-0010	0	10	68.8	22U	22U	22U	49QJ	22U	22U	22U	49QJ	3500

\* U = undetected at listed limit of detection

\*Q and J = estimated concentrations

**Table 2 PCB, Total Organic Carbon and Percent Solids Results for Green Bay Sediment, July 2002.**

STATION ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								Total Organic Carbon (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-11-1024	10	24	77.6	22U	22U	22U	22U	22U	22U	22U	22U	3200
GB02-12-0010	0	10	57.6	23U	23U	23U	23U	23U	23U	23U	23U	24000J
GB02-12-1035	10	35	82	22U	22U	22U	22U	22U	22U	22U	22U	4700
GB02-13-0010	0	10	65.2	22U	22U	22U	110	22U	27QJ	22U	140	6200
GB02-13-1029	10	29	79.2	22U	22U	22U	22U	22U	22U	22U	22U	6300
GB02-14-0010	0	10	78.8	22U	22U	22U	63QJ	22U	22U	22U	63QJ	2700
GB02-14-1028	10	28	79.1	22U	22U	22U	81	22U	22U	22U	81	3800J
GB02-14-2836	28	36	82.6	22U	22U	22U	22U	22U	22U	22U	22U	17000
GB02-15-0010	0	10	75.6	22U	22U	22U	53QJ	22U	22U	22U	53QJ	6100
GB02-15-1030	10	30	76.7	22U	22U	22U	22U	22U	22U	22U	22U	8600J
GB02-15-3040	30	40	79.2	22U	22U	22U	22U	22U	22U	22U	22U	10000
GB02-16-0010	0	10	66.8	22U	22U	22U	98	22U	22U	22U	98	4500
GB02-16-1023	10	23	81.3	22U	22U	22U	32QJ	22U	22U	22U	32QJ	2600
GB02-17-0010	0	10	81.8	22U	22U	22U	31QJ	22U	22U	22U	31QJ	3000
GB02-17-1024	10	24	83.7	22U	22U	22U	22U	22U	22U	22U	22U	870
GB02-18-0010	0	10	76.7	11U	11U	11U	11U	11U	11U	11U	11U	6100J
GB02-18-1034	10	34	82.2	11U	11U	11U	11U	11U	11U	11U	11U	1100
GB02-19-0010	0	10	67.6	11U	11U	11U	170	11U	19QJ	11U	190	8200J
GB02-19-1035	10	35	73.9	11U	11U	11U	110	11U	14QJ	11U	120	6200J
GB02-20-0010	0	10	82	11U	11U	11U	34QJ	11U	11U	11U	34QJ	1200J
GB02-20-1030	10	30	82.1	11U	11U	11U	11U	11U	11U	11U	11U	3100J
GB02-20-3047	30	47	82.3	11U	11U	11U	11U	11U	11U	11U	11U	2200
GB02-21A-0010	0	10	67.5	11U	11U	11U	100	11U	21QJ	11U	120	12000
GB02-21A-1030	10	30	78.2	11U	11U	11U	11U	11U	11U	11U	11U	14000
GB02-21A-3057	30	57	81.3	22U	22U	22U	22U	22U	22U	22U	22U	11000J
GB02-21B-0010	0	10	73.6	22U	22U	22U	75	22U	22U	22U	75	10000
GB02-21B-1030	10	30	77.5	22U	22U	22U	22U	22U	22U	22U	22U	9500J
GB02-22-0007	0	7	72.4	11U	11U	11U	54	11U	11U	11U	54	22000J
GB02-22-0718	7	18	78.4	11U	11U	11U	11U	11U	11U	11U	11U	3800J
GB02-23-0010	0	10	85	22U	22U	22U	27QJ	22U	22U	22U	27QJ	2900J
GB02-23-1018	10	18	85.5	22U	22U	22U	22U	22U	22U	22U	22U	420QJ
GB02-24-0010	0	10	69.9	22U	22U	22U	66QJ	22U	22U	22U	66QJ	8600J
GB02-24-1030	10	30	74.6	22U	22U	22U	22U	22U	22U	22U	22U	3700
GB02-24-3047	30	47	82.3	22U	22U	22U	22U	22U	22U	22U	22U	6700

\* U = undetected at listed limit of detection

\*Q and J = estimated concentrations

**Table 2 PCB, Total Organic Carbon and Percent Solids Results for Green Bay Sediment, July 2002.**

STATION ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								Total Organic Carbon (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-25-0010	0	10	76.8	22U	22U	22U	22U	22U	22U	22U	22U	2000
GB02-25-1030	10	30	78	22U	22U	22U	38QJ	22U	22U	22U	38QJ	1800
GB02-25-3045	30	45	69.5	22U	22U	22U	92	22U	22U	22U	92	3600
GB02-26-0007	0	7	64.1	11U	11U	11U	96	11U	12QJ	11U	110	5800
GB02-27-0010	0	10	77.7	22U	22U	22U	78	22U	22U	22U	78	5300
GB02-27-1030	10	30	76.4	22U	22U	22U	22U	22U	22U	22U	22U	11000
GB02-27-3040	30	40	78.2	22U	22U	22U	22U	22U	22U	22U	22U	13000
GB02-28-0010	0	10	67	22U	22U	22U	100	22U	22U	22U	100	5000
GB02-28-1030	10	30	75.4	22U	22U	22U	22U	22U	22U	22U	22U	15000J
GB02-28-3038	30	38	75.8	22U	22U	22U	22U	22U	22U	22U	22U	8900
GB02-29-0010	0	10	82	22U	22U	22U	22U	22U	22U	22U	22U	3200J
GB02-29-1030	10	30	79.9	22U	22U	22U	22U	22U	22U	22U	22U	7100
GB02-29-3064	30	64	82.5	22U	22U	22U	22U	22U	22U	22U	22U	5500
GB02-30-0010	0	10	59.5	22U	22U	22U	120	22U	27QJ	22U	150	7500
GB02-30-1030	10	30	66.7	22U	22U	22U	42QJ	22U	22U	22U	42QJ	6400
GB02-30-3037	30	37	75.2	22U	22U	22U	22U	22U	22U	22U	22U	10000J
GB02-31-0010	0	10	81.5	11U	11U	11U	11U	11U	11U	11U	11U	4600J
GB02-31-1030	10	30	81.4	11U	11U	11U	11U	11U	11U	11U	11U	9000
GB02-31-3046	30	46	81.4	11U	11U	11U	11U	11U	11U	11U	11U	8300J
GB02-32-0009	0	9	77.3	11U	11U	11U	62	11U	11U	11U	62	2800
GB02-33-0010	0	10	69.1	110U	110U	110U	1900	110U	260QJ	110U	2200	14000
GB02-33-1030	10	30	40.3	2300U	2300U	2300U	30000	2300U	2300U	2300U	30000	30000
GB02-33-3094	30	94	39.2	1100U	1100U	1100U	18000	1100U	1100U	1100U	18000	41000
GB02-34-0010	0	10	57.4	22U	22U	22U	210	22U	29QJ	22U	240	16000
GB02-34-1030	10	30	63.8	130U	130U	130U	1400	130U	130U	130U	1400	18000
GB02-34-3040	30	40	71.8	22U	22U	22U	68QJ	22U	22U	22U	68QJ	7100J
GB02-36-0010	0	10	86.3	22U	22U	22U	36QJ	22U	22U	22U	36QJ	2600J
GB02-36-1030	10	30	84.4	22U	22U	22U	22U	22U	22U	22U	22U	2500J
GB02-36-3066	30	66	69	22U	22U	22U	22U	22U	22U	22U	22U	18000
GB02-37-0010	0	10	83.1	22U	22U	22U	22U	22U	22U	22U	22U	1100J
GB02-37-1030	10	30	82.3	22U	22U	22U	53QJ	22U	22U	22U	53QJ	1500
GB02-37-3053	30	53	81.8	22U	22U	22U	89	22U	22U	22U	89	1300

\* U = undetected at listed limit of detection

\*Q and J = estimated concentrations



**Table 3 Bulk Density Results for Green Bay Sediment, July 2002.**

Station ID	Wet Density (lbs/cf)	Dry Weight Basis		Wet Weight Basis	
		% water	Dry Density (lbs/cf)	% water	Dry Density (lbs/cf)
GB02-01A-0010	97.3	37.2	70.9		
GB02-01A-1030	88.5	70	52		
GB02-01A-3069	90.3	142.8	37.2	58.8	56.9
GB02-01B-0010	113.8	39.9	81.4		
GB02-01B-1030	92.5	71.9	53.8		
GB02-01B-3043	100.7	70.5	59		
GB02-02-0010	98.4	23.7	79.6		
GB02-02-1030	131.4	24.1	106		
GB02-02-3051	133.9	21.9	109.8		
GB02-03-0010	114.2	22.4	93.4		
GB02-03-1030	128.6	30.3	98.7		
GB02-03-3040	131.5	42.8	92.1		
GB02-04-0010	67.7	95.3	34.7		
GB02-04-1030	76.8	120.1	34.9	54.6	49.7
GB02-04-3084	99.9	105.9	48.5	51.4	66
GB02-05-0010	72.2	81.1	39.9		
GB02-05-1030	101.8	71	59.5		
GB02-05-3069	118.1	43.9	82.1		
GB02-06-0010	98.7	41.2	69.9		
GB02-06-1036	103.9	38.2	75.2		
GB02-07-0010	93.4	53.6	60.8		
GB02-07-1030	108.1	35.1	80.1		
GB02-07-3038	104.8	32.4	79.2		
GB02-08-0010	97.7	48.9	65.6		
GB02-08-1030	128.5	25.9	102		
GB02-08-3055	115.5	24	93.2		
GB02-09-0010	125.9	25.4	100.4		
GB02-09-1030	116.2	28.2	90.7		
GB02-09-3038	126.4	30.1	97.2		
GB02-10-0010	116	36.9	84.7		
GB02-10-1030	120.6	23.8	97.5		
GB02-10-3044	104.5	25.8	83		
GB02-11-0010	76.7	36.4	56.3		
GB02-11-1024	50.8	29	39.4		
GB02-12-0010	110.9	36.6	81.2		
GB02-12-1035	126.3	21.8	103.7		
GB02-13-0010	105.7	48.2	71.3		
GB02-13-1029	132	26.2	104.6		
GB02-14-0010	105.6	27	83.1		
GB02-14-1028	98.9	25	79.1		
GB02-14-2836	137.1	25.4	109.3		



**Table 3 Bulk Density Results for Green Bay Sediment, July 2002.**

Station ID	Wet Density (lbs/cf)	Dry Weight Basis		Wet Weight Basis	
		% water	Dry Density (lbs/cf)	% water	Dry Density (lbs/cf)
GB02-15-0010	126.7	32.8	95.4		
GB02-15-1030	137.2	29.1	106.2		
GB02-15-3040	118.5	26.2	93.9		
GB02-16-0010	113.3	41.2	80.2		
GB02-16-1023	133.3	24.3	107.4		
GB02-17-0010	145.1	22.9	118.1		
GB02-17-1024	116.1	22.9	95.1		
GB02-18-0010	95.9	24	77.3		
GB02-18-1034	112.9	18.9	94.6		
GB02-19-0010	90.1	48.9	60.5		
GB02-19-1035	112.6	36.9	82.2		
GB02-20-0010	107.8	22.4	88		
GB02-20-1030	129.6	22.5	105.8		
GB02-20-3047	142	22.4	116		
GB02-21A-0010	116.4	34	86.9		
GB02-21A-1030	110.4	30.7	84.4		
GB02-21A-3057	127	23.6	102.7		
GB02-21B-0010	117.4	39.1	84.4		
GB02-21B-1030	109.7	31.2	83.6		
GB02-22-0007	94	33.8	70.2		
GB02-22-0718	137	27.8	107.2		
GB02-23-0010	129.9	15.6	112.3		
GB02-23-1018	107.3	14.9	93.4		
GB02-24-0010	103.7	42.7	72.7		
GB02-24-1030	116.6	34.1	87		
GB02-24-3047	118.4	22.8	96.5		
GB02-25-0010	102.2	29.7	78.9		
GB02-25-1030	107.9	29.1	83.5		
GB02-25-3045	111	25.3	88.6		
GB02-26-0007	73.8	46.2	50.5		
GB02-27-0010	119.7	29.9	92.1		
GB02-27-1030	117.9	26.7	93		
GB02-27-3040	131	29.4	101.3		
GB02-28-0010	84.8	40.4	60.4		
GB02-28-1030	94	33.7	70.3		
GB02-28-3038	185.1	32.7	139.5		
GB02-29-0010	240.9	21	199.1		
GB02-29-1030	103.9	25.8	82.5		
GB02-29-3064	58.5	26.3	46.4		
GB02-30-0010	85.8	15	74.6		
GB02-30-1030	91.5	45.9	62.7		



**Table 3 Bulk Density Results for Green Bay Sediment, July 2002.**

Station ID	Wet Density (lbs/cf)	Dry Weight Basis		Wet Weight Basis	
		% water	Dry Density (lbs/cf)	% water	Dry Density (lbs/cf)
GB02-30-3037	132.2	31.4	100.6		
GB02-31-0010	119.7	23.4	97		
GB02-31-1030	116.2	22.7	94.7		
GB02-31-3046	138.2	24.5	111		
GB02-32-0009	105	30.3	80.5		
GB02-33-0010	66.6	71.2	38.9		
GB02-33-1030	67.3	165.5	25.3	62.3	41.5
GB02-33-3094	78.8	150.9	31.4	60.1	49.2
GB02-34-0010	82.2	69.8	48.4		
GB02-34-1030	105.5	64.2	64.2		
GB02-34-3040	123.6	34.4	91.9		
GB02-36-0010	98.2	17.4	83.7		
GB02-36-1030	108.9	19.2	91.4		
GB02-36-3066	83.9	63.7	51.3		
GB02-37-0010	134.2	21.1	110.9		
GB02-37-1030	121.5	21.6	99.9		
GB02-37-3053	105.5	18.7	88.9		

**APPENDIX A**

**QUALITY ASSURANCE PLAN ADDENDUM**

---

**ADDEDUM TO**  
**QUALITY ASSURANCE PROJECT PLAN FOR SUPPLEMENTAL DATA**  
**COLLECTION FOX RIVER RI/FS**

**FOR**

**GREEN BAY SEDIMENT ANALYSES**

**Prepared by:**

**The RETEC Group, Inc.  
22 North Carroll St, Suite 370  
Madison, WI 53703**

**RETEC Project No.: WISC16040**

**Prepared for:**

**Wisconsin Department of Natural Resources  
PO BOX 7921**

**101 S. Webster Street  
Madison, Wisconsin 53707**

**September 2, 2002**

**REVISION 1**

**ADDENDUM TO**  
**QUALITY ASSURANCE PROJECT PLAN FOR SUPPLEMENTAL DATA**  
**COLLECTION FOX RIVER RI/FS**

**FOR**

**GREEN BAY SEDIMENT ANALYSES**

**REVISION 1**

**September 3, 2002]**

**Prepared by:**

The RETEC Group, Inc.  
22 North Carroll St, Suite 370  
Madison, WI 53703

---

WDNR PROJECT MANAGER

Date

---

WDNR QA/QC MANAGER

Date

---

USEPA REGION V

Date

---

RETEC PROJECT MANAGER

Date

---

EN CHEM LABORATORY MANAGER

Date

## 1 INTRODUCTION

This addendum provides specific requirements for the collection, preparation, handling and analysis of Green Bay sediment samples in support of the Lower Fox River and Green Bay Remedial Investigation and Feasibility Study (RI/FS). The information in this addendum supplements the ***Quality Assurance Project Plan For Supplemental Data Collection, Fox River RI/FS*** (QAPP), dated June 18, 1998. The format of this addendum follows the original QAPP. Only areas where changes to the original QAPP are necessary to address issues specific to Green Bay sediments are addressed below.

## 2 PROJECT DESCRIPTION

### 2.1 SITE BACKGROUND

Green Bay is a narrow, elongated bay, approximately 190-km (119 mi) in length and an average of 37 km (23 mi) in width. The southern end of the bay is a warm water estuary with shallow water depths, while the northern end is deeper cold water more typical of Lake Michigan. The mean depth of the bay is approximately 20 m (65 ft). Few areas of the bay have depths exceeding 40 m (131 ft). Green Bay covers an area of approximately 4,150 km<sup>2</sup> (1,600 mi<sup>2</sup>) and has a water volume of about 83 km<sup>3</sup> (20 mi<sup>3</sup>). Currents tend to flow counterclockwise in Green Bay. Water from the Lower Fox River flows northeasterly up the east shore of Green Bay while Lake Michigan and northern Green Bay waters move southward along the west shore.

Prior to construction of the confined disposal facility (CDF), Renard Island, open water disposal of navigational dredge spoils often occurred. Historically, several locations in Green Bay were used as disposal sites. The volume of sediment disposed of in this manner is unknown. However, since open water disposal was in practice at the same time PCBs were discharged into the Lower Fox River, it is likely these dredge spoils also carried PCB.

During the public comment period following the release of the 2001 Draft RIFS concerns were raised about potential PCB hotspots in Green Bay. PCB mapping showed several areas with elevated PCB levels. There are few data points in the southern end of Green Bay and thus some of these hotspot areas originated around a single data point. In December 2001, the Fox River Group collected a series of sediment samples in the southern end of Green Bay to address this lack of data. However, the open water disposal sites were not sampled to any great extent.

### 2.2 DATA COLLECTION OBJECTIVES

There are two principal objectives for the additional sediment analyses in Green Bay:

***To more thoroughly characterize areas of Green Bay associated with historic open water dredge disposal areas and navigation channel side casts.*** While the Fox River Database (FRDB) contains a substantial number of data points throughout Green Bay, the scale is not adequate to characterize these areas.

***To provide additional sediment characterization of the extreme southern end of Green Bay.***

Numerous comments on the Lower Fox River and Green Bay Proposed Remedial Action Plan and

RI/FS focused on the presence of hotspots and estimates of PCB mass present in Green Bay. Data will be collected to support the agencies refinement of PCB mass and concentration bedmaps.

### 2.3 SCHEDULE

Given the agencies desire to address this issue quickly, this characterization will be completed as quickly as possible, following a notice to proceed. The following is a tentative schedule, subject to completing the contracting process:

Field work: week of July 22, 2002

Laboratory Data Available (non-validated): beginning the week of August 19, 2002

Data Validation Complete: 3 weeks following receipt of all necessary laboratory data

Reporting: 3 weeks following completion of data validation.

## 3 Project Organization

Project organization for the Green Bay sediment sampling is listed below where differences from the original QAPP exist.

WDNR Project Manager: Greg Hill, WDNR, WT/2, 101 South Webster Street, PO Box 7921, Madison, WI 53707-7921, phone (608) 267-9352.

Project Manager: Robert Paulson, The RETEC Group, 22 N. Carroll St., Madison, WI 53707, phone (608) 255-0805.

Laboratory Project Manager: Tod Noltemeyer, En Chem, Inc., 525 Science Drive, Madison, WI, 53711, phone (608) 232-3301.

Data Validator: Marcia Kuehl, MA Kuehl Co., 3470 Charlevoix Ct, Green Bay, WI 54311, phone (920) 469-9113.

## 4 Quality Assurance Objectives

### 4.1 Field Quality Objectives

Sampling precision and bias will be assessed through the collection of co-located cores not field duplicates. Side by side cores will be collected at 5% of the sampling locations. The top two core segments (0-10 and 10-30 cm) will be submitted for analysis recognizing that the third segment from any individual core may have a different total length. No control limits will be applied to these results given that they reflect the total variability one could expect (spatial, prep, and analytical).

### 4.2 Laboratory Quality Objectives

Aroclor PCBs are the primary analytical parameter of interest. The most significant difference between this current project and the 1998 QAPP is the use of different analytical laboratories. Analytical quality controls will be applied at the following frequencies:

Method Blank: 5% or 1 per batch

Initial Instrument Calibration: Five point curve using Aroclor 1242 and 1254

Continuing Calibration Verification: every 10 samples

Surrogates: every sample

MS/MSD: 5% or 1 per batch

Laboratory Control Spikes: 1 per batch.

Applicable control limits and corrective actions are identified in EN CHEM SOP: SVO-FOX (Attachment A). Given the survey nature of the Green Bay sediment sampling one could consider the lowest PCB Action Level evaluated in the RIFS, 125 ug/kg, as a Project Action Limit. Thus, to provide useful data at this level, the Project Quantitation Limit is defined as 50 ug/kg. Further, the Achievable Laboratory Method Detection Limit is defined as 22 ug/kg.

Total organic carbon (TOC) is a secondary analytical parameter. TOC is commonly used to normalize PCB data when evaluating bioavailability. Analytical quality controls will be applied at the following frequencies:

Method Blank: 5% or 1 per batch

Initial Instrument Calibration: Five point curve using Aroclor 1242 and 1254

Continuing Calibration Verification: every 10 samples

Surrogates: every sample

MS/MSD: 5% or 1 per batch

Laboratory Control Spikes: 1 per batch.

Applicable control limits and corrective actions are identified in EN CHEM SOP: WCM-9 (Attachment B) with one exception. The exception is that the control limits for MS/MSD are 75-125%. Results outside of this range will be appropriately qualified. Given the secondary use of this data, there are no established Project Action or Quantitation Limits.

Similar to TOC, bulk density is a physical parameter that is commonly used in the calculation of contaminant mass. Being a physical measurement, there are no applicable laboratory quality control objectives. Quality control will be assured through use of laboratory SOP (Attachment C).

## **5 Sediment Sampling Design**

Sediment samples collected at 26 locations will comprise the characterization of the open water disposal and side cast areas. USEPA FIELDS originally identified these locations. Sediment collected at 10 additional locations will comprise the hotspot characterization. These locations were identified with assistance from WDNR of which four locations have been sampled previously. Proposed sediment core locations are listed in **Table 1**. In the unlikely event that a pre-planned core location is physically located within the federal navigation channel, that point will be relocated outside of the channel. The actual coordinates of each core location will be located using GPS and recorded.

Sediment cores will be collected using WDNR's standard push coring methodology described in Appendix D of the original QAPP. Cores will be segmented as described in the QAPP except that the segmentation will be: 0-10 cm, 10-30 cm and 30 cm to the bottom of the core.

## **6 CHAIN OF CUSTODY**

No changes from original QAPP.

## **7 ANALYTICAL METHODS**

Analytical methods and SOPs designated in **TABLE 2** will be followed. Any deviations or non-conformance to these methods must be documented and corrective action procedures followed as per Section 13 of the QAPP. Policy and procedures documented on the QAPP for calibration, data review, data reporting, assessment of data quality (precision, accuracy and completeness), data validation, and preventive maintenance will be followed.

All analytical SOPs are included as **ATTACHMENTS** to this Addendum.

## **8 CALIBRATION PROCEDURES**

No changes from original QAPP other than identifying En Chem and calibration procedures contained in attached SOP.

## **9 DATA REDUCTION, REVIEW, AND REPORTING**

As identified in EN CHEM SOP: SVO-FOX, two % moisture determinations are conducted. A % moisture is determined on the sample as received at the laboratory and a second is conducted following the air drying step. Both % moisture determinations are to be reported with the Aroclor PCB and TOC analytical results.

## **10 PERFORMANCE AND SYSTEM AUDITS**

EnChem is certified by the State of Wisconsin for both Aroclor PCB and TOC. There is no certification program for physical parameters such as bulk density therefore CQM will be judged acceptable based on their specific method SOP and on-going project performance.

**11 PREVENTATIVE MAINTENCE**

No changes from original QAPP.

**12 ASSESSING DATA PRECISION, ACCURACY AND COMPLETNESS**

No changes from original QAPP.

**13 CORRECTIVE ACTIONS**

No changes from original QAPP.

**14 QUALITY ASSURANCE REPORTING**

No changes from original QAPP.

Table 1. Planned sediment core locations.

STATION ID	LONG DMS	LAT DMS
GB02-01	088 00 03.485618	44 33 18.093357
GB02-02	087 59 06.877724	44 33 17.098675
GB02-03	088 00 31.776726	44 32 57.849699
GB02-04	088 00 04.195260	44 32 57.367952
GB02-05	087 59 35.175253	44 32 56.859060
GB02-06	087 59 07.592940	44 32 56.373477
GB02-07	087 57 12.865687	44 36 46.206867
GB02-08	087 56 28.175156	44 37 25.360129
GB02-09	087 55 41.984833	44 37 55.458836
GB02-10	087 54 27.702526	44 38 03.126964
GB02-11	087 53 54.116139	44 38 33.444187
GB02-12	087 54 46.298843	44 38 38.267990
GB02-13	087 56 26.571613	44 36 28.618678
GB02-14	087 56 34.845120	44 35 07.565487
GB02-15	087 55 38.557271	44 35 18.148159
GB02-16	087 58 16.869710	44 35 30.013277
GB02-17	087 58 22.400688	44 34 34.687532
GB02-18	087 58 49.211011	44 34 41.607170
GB02-19	087 57 39.148669	44 35 25.474728

STATION ID	LONG DMS	LAT DMS
GB02-20	087 57 35.047848	44 34 48.022567
GB02-21	087 56 25.059384	44 35 29.300873
GB02-22	087 55 02.184705	44 35 26.508925
GB02-23	087 55 39.976129	44 34 38.217146
GB02-24	087 55 25.140240	44 37 21.641050
GB02-25	087 58 12.457005	44 35 53.135536
GB02-26	087 58 01.364206	44 35 09.114700
GB02-27	087 56 04.659584	44 34 54.131422
GB02-28	087 55 33.715162	44 35 52.861235
GB02-29	087 56 30.889104	44 36 59.630645
GB02-30	087 53 54.999624	44 38 08.971051
GB02-31	087 56 38.146134	44 34 25.090299
GB02-32	087 58 26.957315	44 34 59.258056
GB02-33	088 00 09.055795	44 32 24.747121
GB02-34	088 00 40.991727	44 32 58.010239
GB02-35	088 00 31.764728	44 32 37.110980
GB02-36	087 59 35.135267	44 32 37.096694
GB02-37	087 59 35.181662	44 33 17.596343

Table 2: Designated Laboratory and Analytical Methods

Parameter	Method	Designated Laboratory
PCB Aroclors	EPA 8082	En Chem
Total Organic Carbon (TOC)	EPA SW 90260	En Chem
Bulk Density	ASTM D2937/D2216	CQM

## **ATTACHMENT A**

**Not available for electronic version of report.**

## **ATTACHMENT B**

**Not available for electronic version of report.**

## **ATTACHMENT C**

<p><b>CQM, INC.</b> 2679 Continental Drive Green Bay, Wisconsin 54311 (920) 465-3911</p>	<b>QUALITY ASSURANCE</b>		
	CQM Procedure Number:	Con Mat 2-7	
	Page: <u>1</u>	of <u>6</u>	
	Date: <u>3/16/00</u>	Approval: <u>R. Rouse</u>	
	Supersedes: <u>4/13/99</u>		
Subject:	Test Method for Density of Soil In-Place by the Drive-Cylinder Method ASTM: D2937-83 (Reapproved 1990)		

## 1.0 SCOPE

- 1.1 This method covers the determination of in-place density of soil by obtaining a relatively undisturbed soil sample utilizing a thin walled cylinder.
- 1.2 This method is not appropriate for organic soils, gravels or very hard soils which cannot be easily penetrated.
- 1.3 This procedure provides the guidelines for obtaining specimens for determination of in-place density and water content of collected sample.

## 2.0 APPLICABLE REFERENCES

### 2.1 ASTM Standards

- D698 Method for Laboratory Compaction Characteristics of Soil Using Standard Effort using 5.5 lbf. (2.49 kg) Rammer with a 12 inch drop.  
D1557 Method for Laboratory Compaction Characteristics of Soil Using Modified Effort Using 10 lbf (4.54 Kg) Rammer with an 18 inch drop.  
D2216 Method for Laboratory Determination is Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures

## 3.0 EQUIPMENT

- 3.1 Drive cylinders (thin wall tubes).
- 3.2 Push plate or drive head.
- 3.3 Shovel.
- 3.4 Scales or balances accurate to 0.1 gram.
- 3.5 Ovens.
- 3.6 Vernier caliper.
- 3.7 Paraffin wax - optional. Required if samples cannot be trimmed to shape that is accurately measurable.

<b>CQM, INC.</b> <i>2679 Continental Drive Green Bay, Wisconsin 54311 (920) 465-3911</i>	<b>QUALITY ASSURANCE</b> <b>CQM Procedure Number:</b> Con Mat 2-7 Page: <u>2</u> of <u>6</u> Date: <u>3/16/00</u> Approval: <u>R Rose</u> Supersedes: <u>4/13/99</u>
Subject: Test Method for Density of Soil In-Place by the Drive-Cylinder Method ASTM: D2937-83 (Reapproved 1990)	

3.8 Miscellaneous items: Hot pads/gloves, labels, plastic bags, metal pans for ovens and brushes.

#### 4.0 PERSONNEL REQUIREMENTS

- 4.1 CQM, Inc. will supply an engineering technician to perform the test.
- 4.2 Results of the tests will be reviewed by laboratory personnel with a minimum of five years experience or a staffed professional engineer.

#### 5.0 SAMPLING

##### 5.1 Sampling at or Near the Surface:

- 5.1.1 Prepare the area to be sampled by leveling the location with a shovel or bull dozer blade.
- 5.1.2 Assemble the drive cylinder, push plate and place the sharpened edge on the surface.
- 5.1.3 The sampling apparatus is pushed into the soil by hydraulic driven bull dozer blade or similar type equipment working at the site.
- 5.1.4 If no power equipment is on-site, the sampler can be driven into the soil with a sledge hammer.
- 5.1.5 The drive cylinder should be kept as vertical in position as possible during sampling.
- 5.1.6 After removal from the sampling location, take the push plate off and inspect the drive cylinder to make sure a representative and adequate sample has been collected.
- 5.1.8 Cap the ends of the drive cylinder, secure the caps with duct tape on the cylinder and label the cylinder for transport to the testing laboratory.

<b>CQM, INC.</b> <i>2679 Continental Drive Green Bay, Wisconsin 54311 (920) 465-3911</i>	<b>QUALITY ASSURANCE</b> <b>CQM Procedure Number:</b> <u>Con Mat 2-7</u> <b>Page:</b> <u>3</u> <b>of</b> <u>6</u> <b>Date:</b> <u>3/16/00</u> <b>Approval:</b> <u>R. Rouse</u> <b>Supersedes:</b> <u>4/13/99</u>		
<b>Subject:</b> Test Method for Density of Soil In-Place by the Drive-Cylinder Method ASTM: D2937-83 (Reapproved 1990)			

## 5.2 Sampling Below the Surface:

- 5.2.1 Drill a hole with an auger to the depth or elevation to be sampled.
- 5.2.2 Assemble cylinder and drive head with adequate extensions and place firmly on the layer to be sampled. Drive the cylinder into the soil with a hammer on the top of the drive rod. Drive the cylinder to a predetermined depth.
- 5.2.3 Remove the assembly from the hole by power equipment or pipe wrenches placed at 180°F of each other and two individuals pulling up on the wrenches to remove sample. After removal, take the drive head off and inspect the drive cylinder for a representative and adequate sample.
- 5.2.4 Cap the ends of the drive cylinder and secure the caps with duct tape on the cylinder. Label the cylinder for transport to the testing laboratory.

## 6.0 PROCEDURE

- 6.1 Drive cylinders as received at the laboratory will be documented in appropriate files on when they were delivered.
- 6.2 The soil will be removed from the cylinder. A representative portion of soil shall be selected and trimmed to a minimum volume of 0.15 ft<sup>3</sup> (430 cm<sup>3</sup>) or at least a 4.25 inch long sample from a 3" diameter cylinder.
- 6.3 Measurements will be taken on the sample portion selected using a vernier caliper. A minimum of four (4) measurements will be obtained for the diameter and again for the height of the sample.
- 6.4 After measurements, the sample shall be weighed and the weight recorded.
- 6.5 Place the specimen in the oven and dry the sample at 230°F for at least 16 hours.
- 6.6 After the specimen has dried, take the specimen out of the oven, let it cool and weigh the specimen.
- 6.7 Alternative Procedure - Wax:
  - 6.7.1 If the sample is brittle or there are numerous voids in the sample, then a paraffin wax procedure can be implemented.

<b>CQM, INC.</b> <i>2679 Continental Drive Green Bay, Wisconsin 54311 (920) 465-3911</i>	<b>QUALITY ASSURANCE</b> <b>CQM Procedure Number:</b> <u>Con Mat 2-7</u> <b>Page:</b> <u>4</u> <b>of</b> <u>6</u> <b>Date:</b> <u>3/16/00</u> <b>Approval:</b> <u>R. House</u> <b>Supersedes:</b> <u>4/13/99</u>		
<b>Subject:</b> Test Method for Density of Soil In-Place by the Drive-Cylinder Method ASTM: D2937-83 (Reapproved 1990)			

- 6.7.2 Prepare and trim the specimens as much as can be done. Weigh the specimen and record in grams. Add a wire to the sample, weight of wire already known, and immerse specimen and wire into melted paraffin wax for coating the sample.
- 6.7.3 Weigh the sample, wire and wax, and record.
- 6.7.4 After cooling, immerse waxed sample in water and record weight of specimen immersed.
- 6.7.5 Remove specimen from water, carefully remove the wax from the specimen and recheck the weight of specimen and compare with original weight.
- 6.7.6 Place sample in oven at 230°F for a minimum of 16 hours and record dry weight.

## 7.0 CALCULATIONS

### 7.1 Calculations for Caliper Samples:

#### 7.1.1 Volume of Specimen:

$$V = \frac{\pi^2 h}{1728} 3.1416$$

V = Volume of sample in ft.<sup>3</sup>

h = Average height of specimen (inches).

r<sup>2</sup> = Radius of sample - squared

1728 = Cubic inches/cubic foot

#### 7.1.2 Wet Density of Sample:

$$\frac{W_w}{453.5924} = V = D_w$$

D<sub>w</sub> = Wet density of specimen (lbs./cu.ft.)

W<sub>w</sub> = Wet weight of specimen (grams)

V = Volume of specimen (cu.ft.)

#### 7.1.3 Moisture Content of Specimen:

**CQM, INC.**

*2679 Continental Drive  
Green Bay, Wisconsin 54311  
(920) 465-3911*

**QUALITY ASSURANCE****CQM Procedure Number:****Con Mat 2-7**Page: 5 of 6Date: 3/16/00 Approval: R RoseSupersedes: 4/13/99

Subject: Test Method for Density of Soil In-Place by the Drive-Cylinder Method  
ASTM: D2937-83 (Reapproved 1990)

$$W_w - WD = W$$

$$W - WD \times 100 = Mc$$

W<sub>w</sub> = Wet density of specimen (grams)W<sub>D</sub> = Dry weight of specimen (grams)

W = Weight of water (grams)

Mc = Moisture Content

**7.1.4 Dry Density of Sample:**

$$\frac{WD}{453.5924} - V = DD$$

DD = Dry density of specimen (lbs./cu.ft.)

WD = Dry weight of specimen (grams)

V = Volume of specimen (cu.ft.)

**7.2 Calculations for Specimens Using Paraffin Wax:****7.2.1 Wet Density of Sample:**

$$\frac{W_w}{WW_w - WI - [WW_w - W_w]} = Sp.Gr. \\ .903$$

$$Sp.Gr. 62.4 = WD$$

W<sub>w</sub> = Wet weight of sample (grams)WW<sub>w</sub> = Wet weight of sample w/wax and wire added (grams)

WI = Immersed weight of waxed sample (grams)

Sp.Gr. = Specific gravity of sample

WD = Wet density of sample

<p><b>CQM, INC.</b> <i>2679 Continental Drive Green Bay, Wisconsin 54311 (920) 465-3911</i></p>	<b>QUALITY ASSURANCE</b>	
	CQM Procedure Number:	Con Mat 2-7
	Page: <u>6</u> of <u>6</u>	
	Date: <u>3/16/00</u> Approval: <u>R. Rouse</u>	
	Supersedes: <u>4/13/99</u>	
Subject:	Test Method for Density of Soil In-Place by the Drive-Cylinder Method ASTM: D2937-83 (Reapproved 1990)	

#### 7.2.2 Moisture Content of Specimen

Refer to 7.1.3 for formula.

#### 7.2.3 Dry Density of Sample

Refer to 7.1.4 for formula.

### 8.0 REPORT

#### 8.1 The following information should be included:

Location sampled, sample elevation or depth, dry density, water content and soil classification.

#### 8.2 Laboratory worksheets will be reviewed and processed information placed in the project file.

**APPENDIX B**

**SEDIMENT CORE LOGS AND PHOTOS**

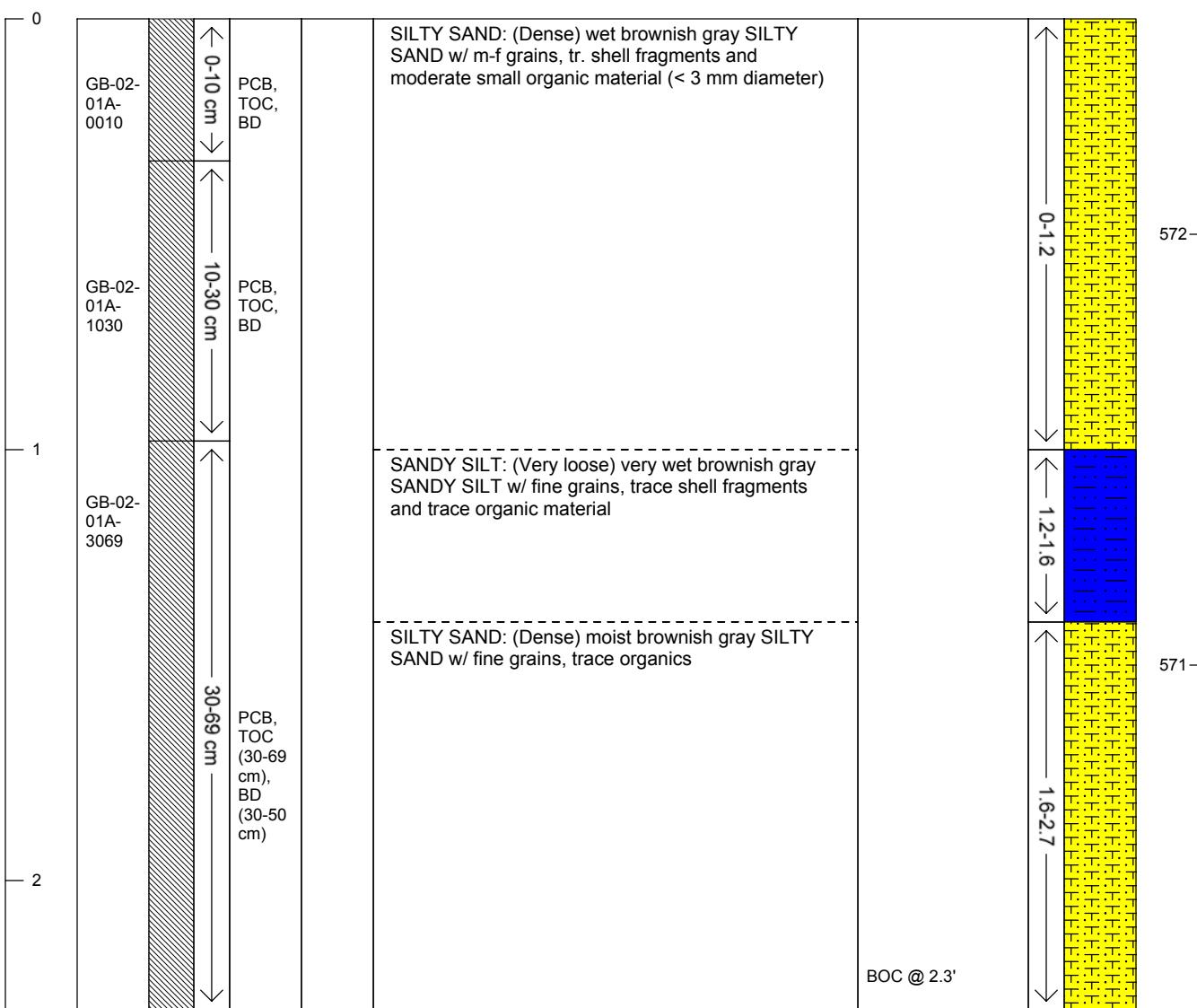


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-01A

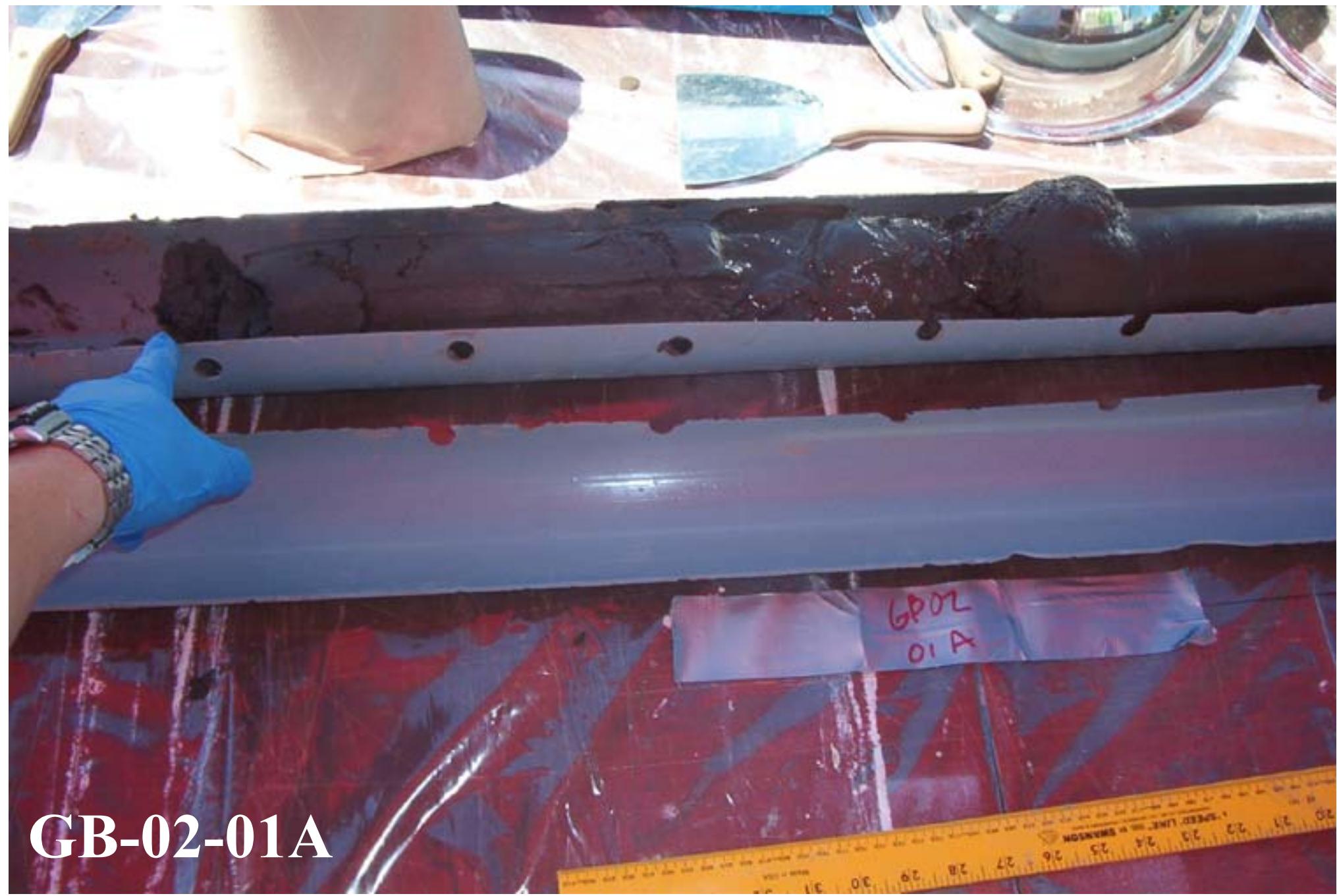
Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.7 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>6.5</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/23/2002</b>	Mudline Elevation (ft): <b>572.5 ft</b>	Recovery in ft (%): <b>2.3 (85)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>269512</b>	E./LONG: <b>2489523</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density from 30-50 cm  
TOC, PCB from 30-69 cm

Calculated Recovery  
Sample Length/Penetration Length:  
 $2.3 / 2.7 = 85 \%$



GB-02-01A



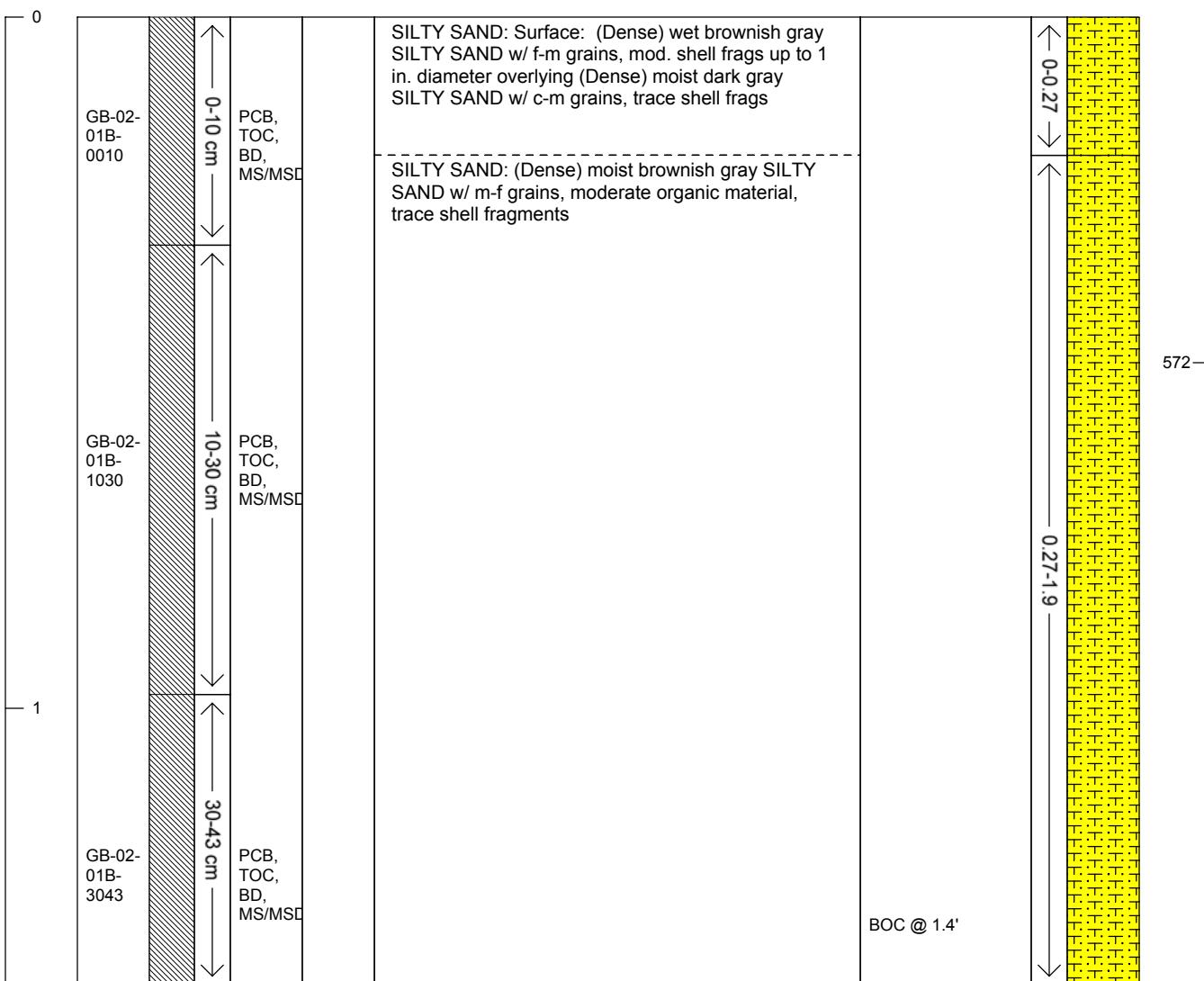
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-01B

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-14060-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.9 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>6.5</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/23/2002</b>	Mudline Elevation (ft): <b>572.5 ft</b>	Recovery in ft (%): <b>1.4 (74)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>269512</b>	E./LONG: <b>2489523</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Remarks: <u>TOC and PCB - 8 oz.</u> <u>Bulk density for each increment</u> <u>MS/MSD collected from each increment</u>	Calculated Recovery Sample Length/Penetration Length: <u>1.4 / 1.9 = 74 %</u>
---	--	---



**GB-02-01B**



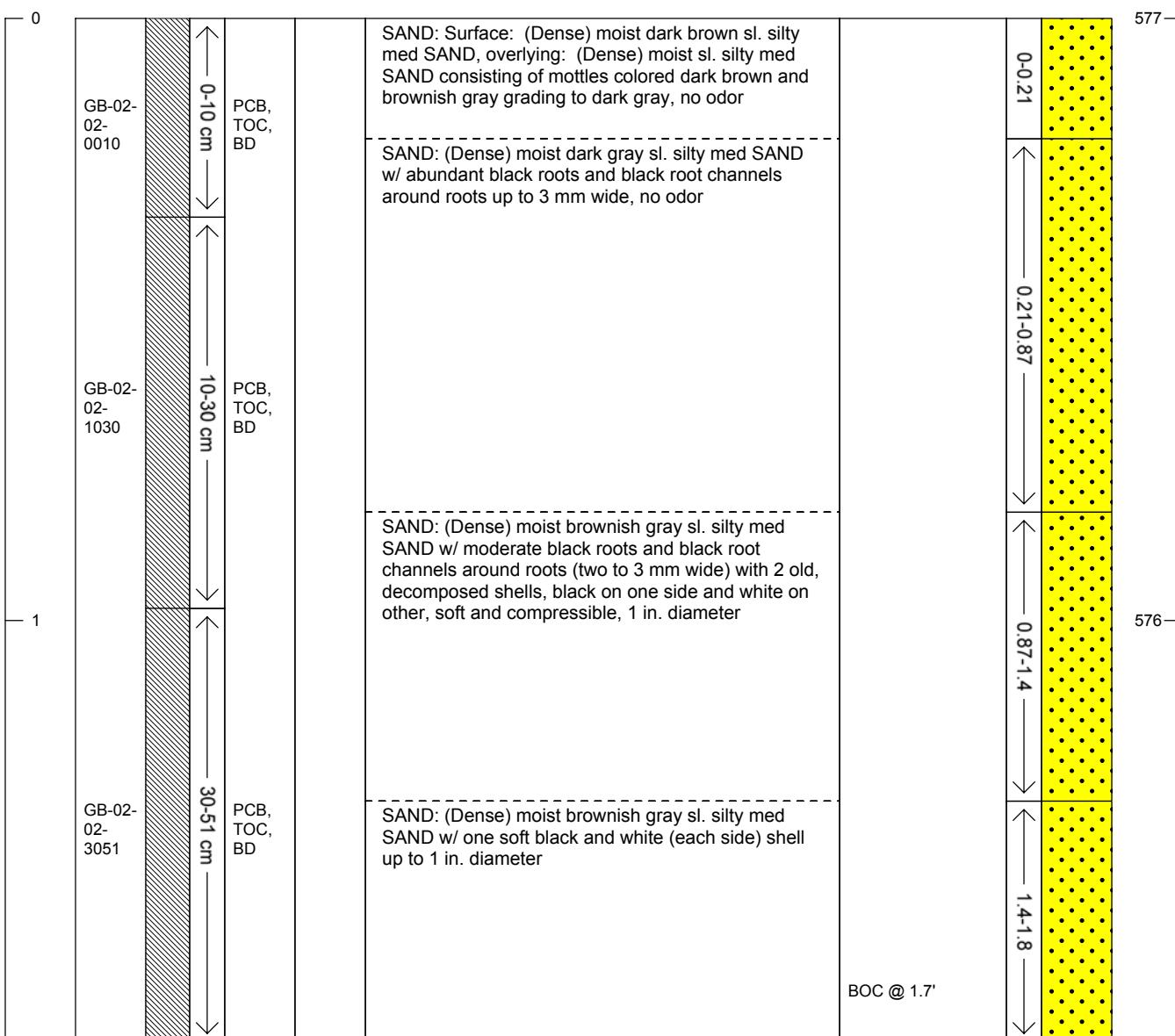
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-02

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.8 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>2</b>	Sample Quality: <b>poor</b>
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>577 ft</b>	Recovery in ft (%): <b>1.7 (94)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>269534</b>	E./LONG: <b>2493606</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)
-----------------------------	----------	---------------------------	----------	------------------	--	----------	--	---------------------------





**GB-02-02**

**GB-02-02**  
**Shells**



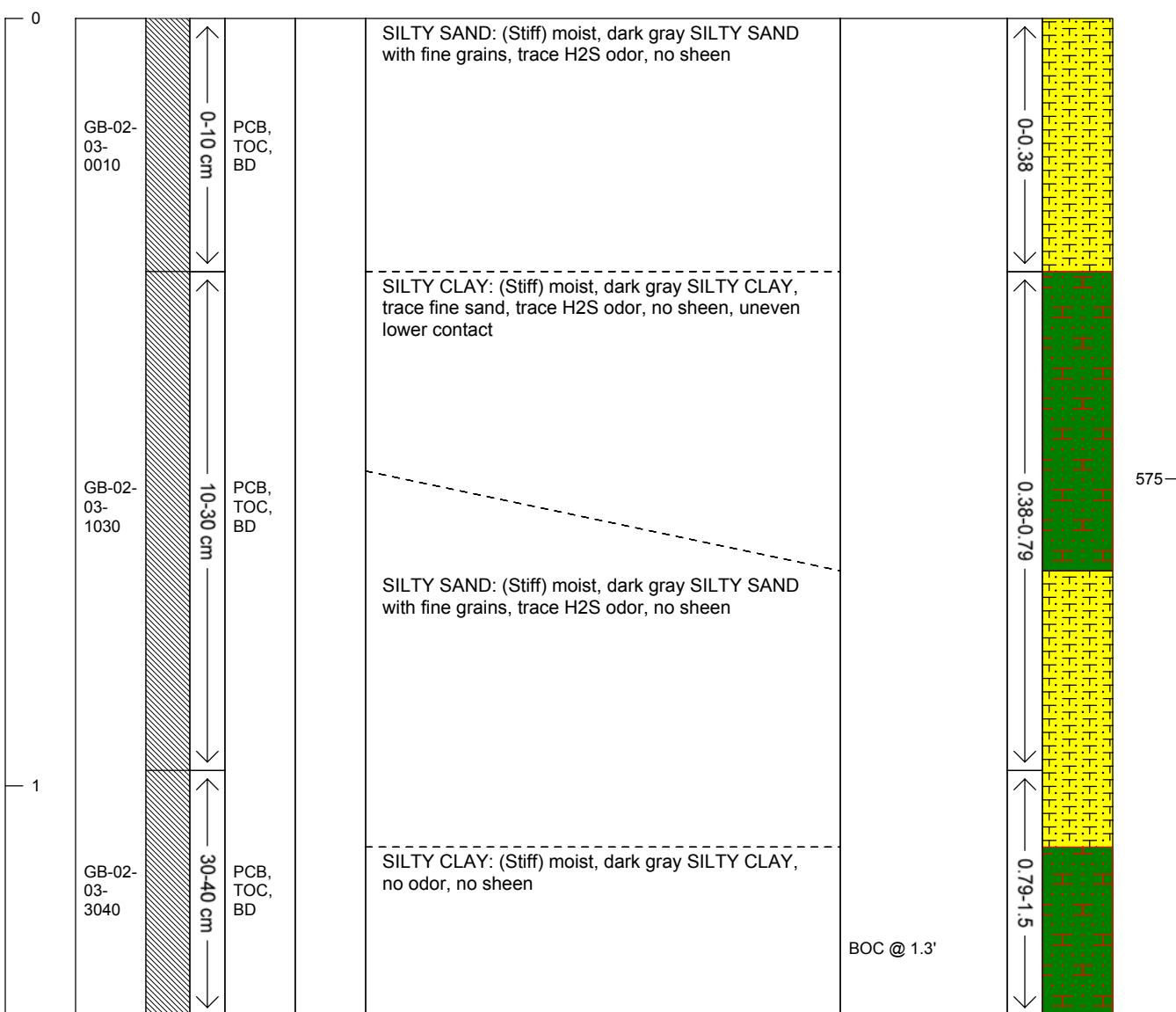


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-03

Project: Green Bay Supp. Sed. Samp.		Water Body Type: Lacustrine	Tube Length: 6.0 ft					
Project #: WISCN-16040-100		SW Elevation (ft)/Tide: 579 ft	Penetration Depth: 1.3					
Client: WDNR		Water Depth (ft): 3.4	Sample Quality: good					
Collection Date: 7/22/2002		Mudline Elevation (ft): 575.6 ft	Recovery in ft (%): 1.3 (87)					
Contractor: RETEC		N./LAT: 267433 E./LONG: 2487544	Process Date: 7/22/2002					
Vessel: 25' sampling boat		Horiz. Datum: NAD 83 Vert. Datum: IGLD 85	Process Method: Extrude					
Operator: Superior Services		Method/Tube ID: Diver assited 3 in. push core	Logged By: Dan Berlin					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: 0-40 cm hand push core  
1 - 8 oz. Jar - PCB, TOC  
Half core segment for bulk density

Calculated Recovery  
Sample Length/Penetration Length:  
1.3 / 1.5 ft = 87 %



GB-02-03

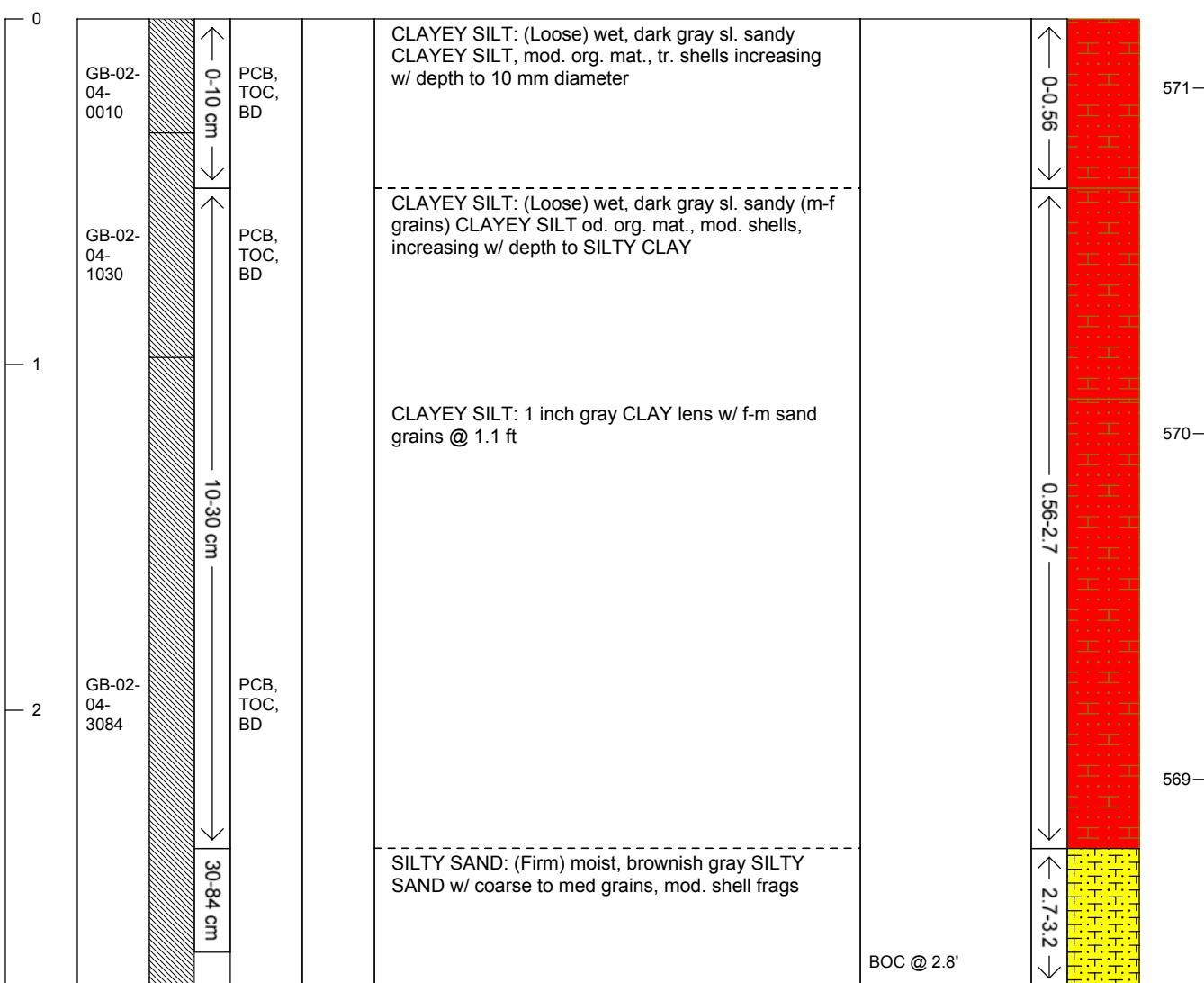


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-04

Project: Green Bay Supp. Sed. Samp.		Water Body Type: Lacustrine	Tube Length: 6.0 ft					
Project #:		SW Elevation (ft)/Tide: 579 ft	Penetration Depth: 2.8					
Client: WDNR		Water Depth (ft): 7.8	Sample Quality: good					
Collection Date: 7/22/2002		Mudline Elevation (ft): 571.2 ft	Recovery in ft (%): 2.8 (88)					
Contractor: RETEC		N./LAT: 267423 E./LONG: 2489548	Process Date: 7/22/2002					
Vessel: 25' sampling boat		Horiz. Datum: NAD 83 Vert. Datum: IGLD 85	Process Method: Extrude					
Operator: Superior Services		Method/Tube ID: Diver assited 3 in. push core	Logged By: Dan Berlin					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density all 3 sections  
TOC, PCB 30-84 cm  
BD 40-60 cm

Calculated Recovery  
Sample Length/Penetration Length:  
2.8 / 3.2 ft = 88 %



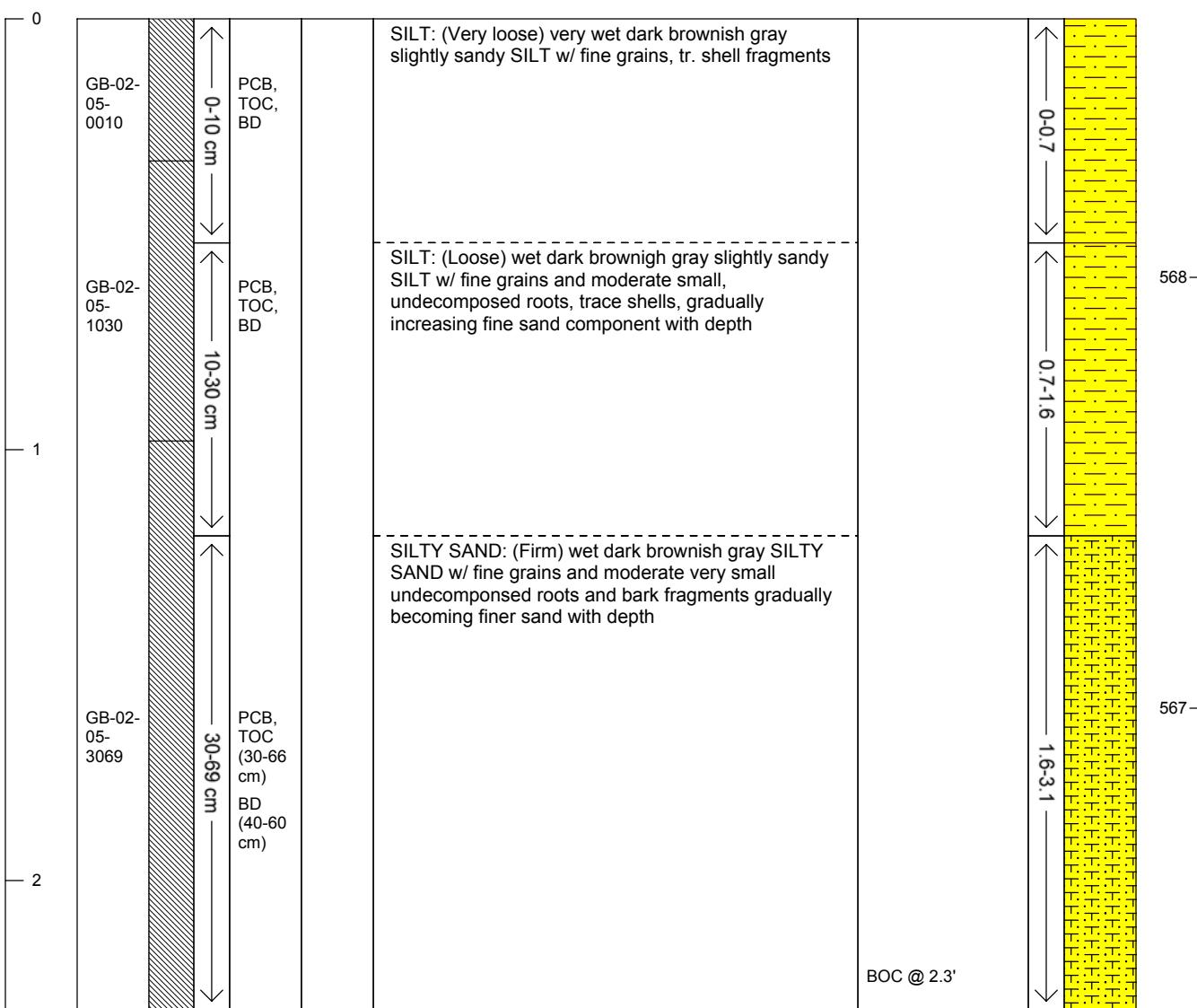
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-05

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.3</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>10.4</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>568.6 ft</b>	Recovery in ft (%): <b>2.3 (74)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>267399</b>	E./LONG: <b>2491618</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

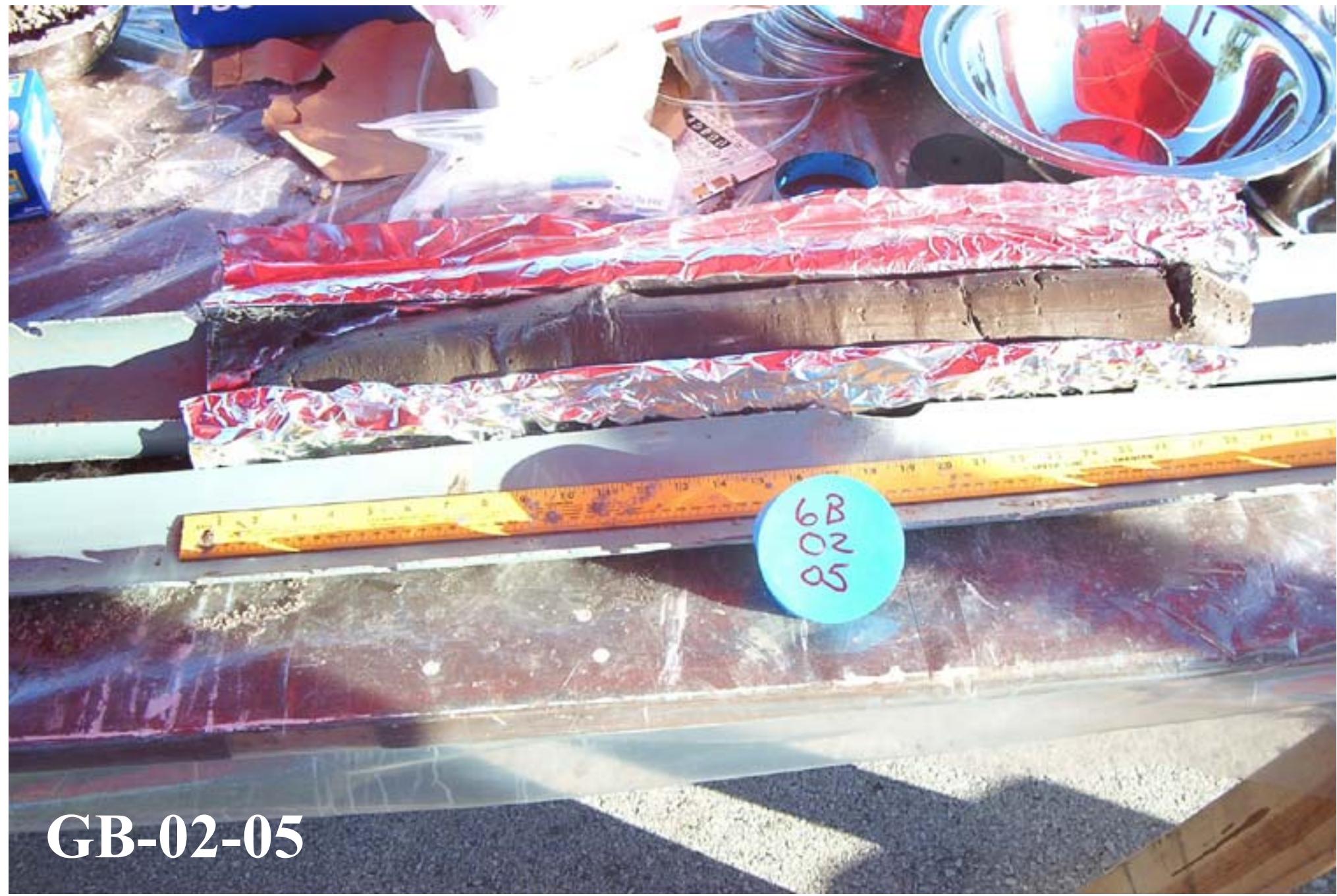
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density from 40-60  
Chemistry (PCB & TOC) 30-66

Calculated Recovery  
Sample Length/Penetration Length:  
 $2.3 / 3.1 = 74 \%$



GB-02-05

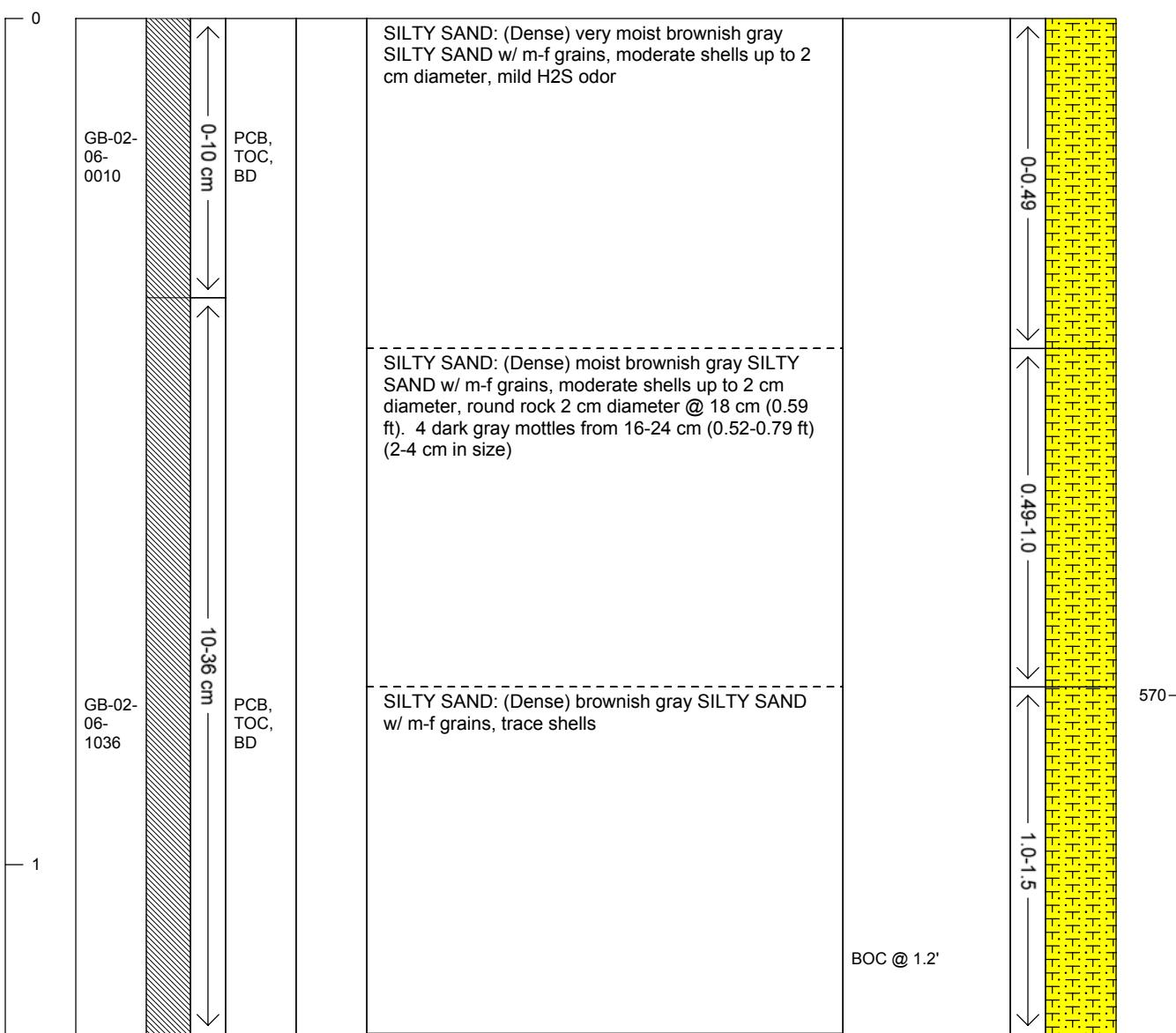


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-06

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>8.2</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/23/2002</b>		Mudline Elevation (ft): <b>570.8 ft</b>	Recovery in ft (%): <b>1.2 (80)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>267408</b> E./LONG: <b>2493610</b>	Process Date: <b>7/23/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-06

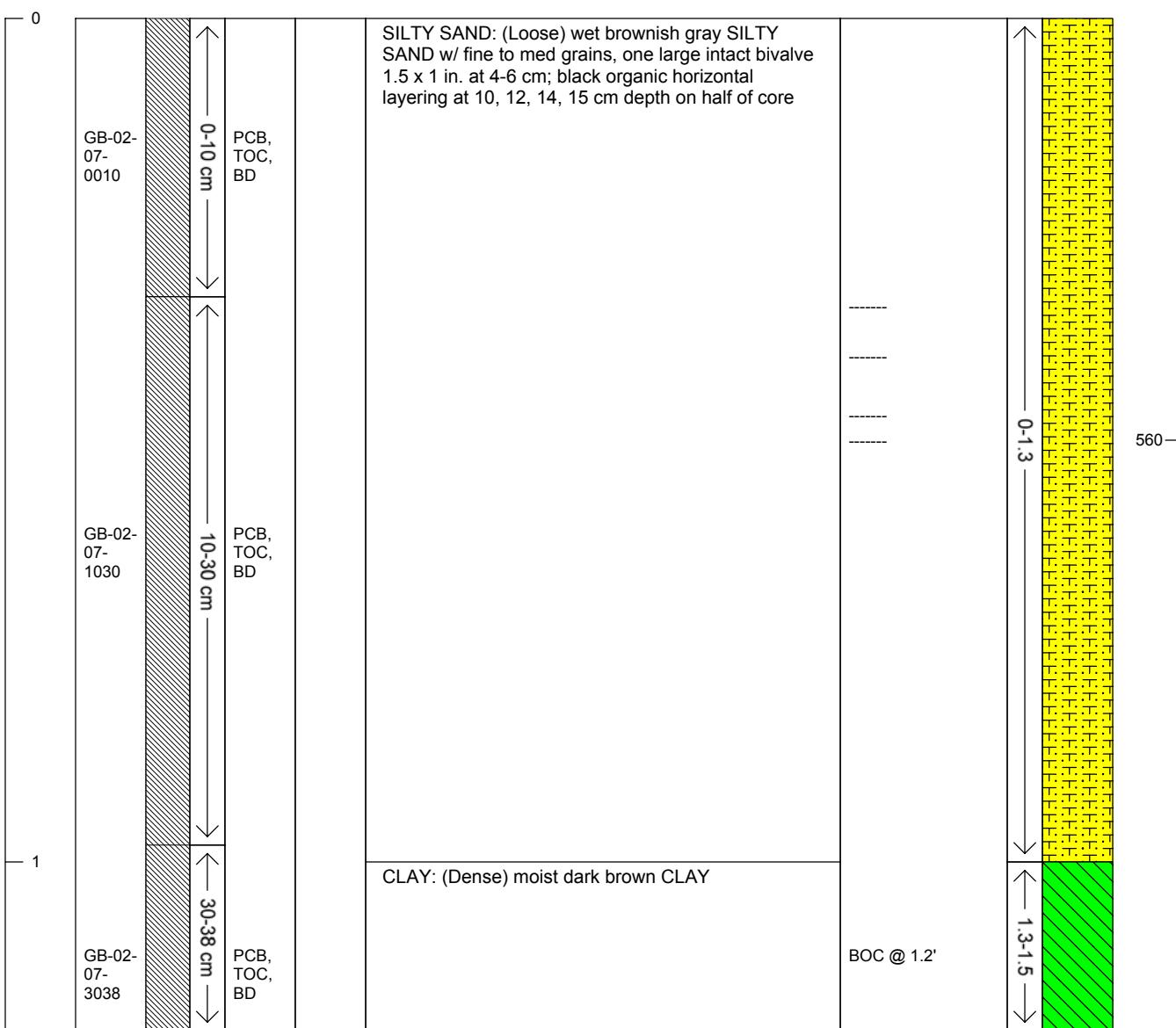


# Sediment Core Log

Core: GB-02-07

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>18.5</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>560.5 ft</b>	Recovery in ft (%): <b>1.2 (80)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>290880</b> E./LONG: <b>2501347</b>	Process Date: <b>7/25/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: TOC, PCB and bulk density from each increment

Calculated Recovery  
Sample Length/Penetration Length:  
 $1.2 / 1.5 \text{ ft} = 80\%$  %



**GB-02-07**

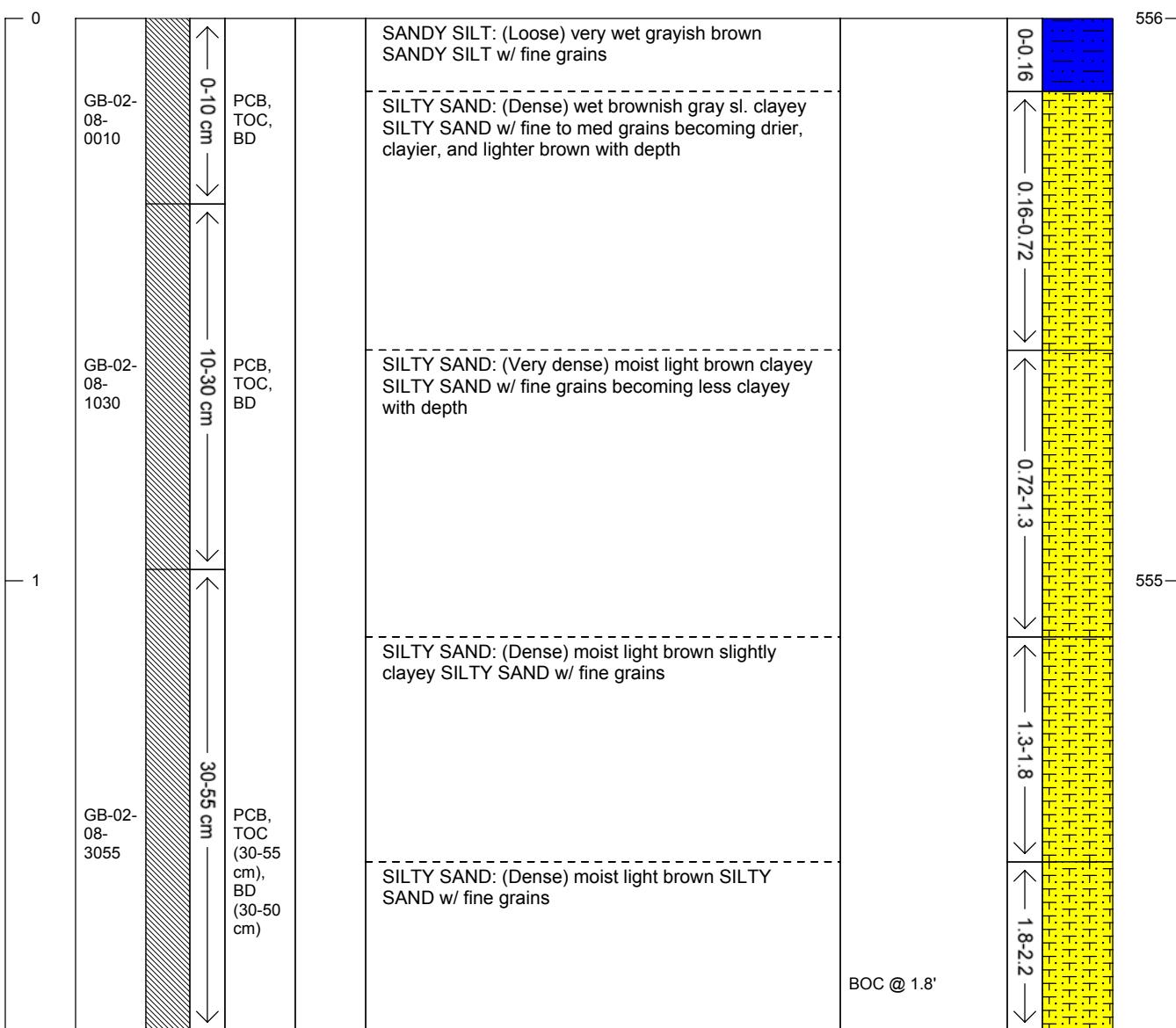


# Sediment Core Log

Core: GB-02-08

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.2 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>23</b>	Sample Quality: <b>fair</b>						
Collection Date: <b>7/25/2002</b>	Mudline Elevation (ft): <b>556 ft</b>	Recovery in ft (%): <b>1.8 (82)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>294937</b>	E./LONG: <b>2504478</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-08

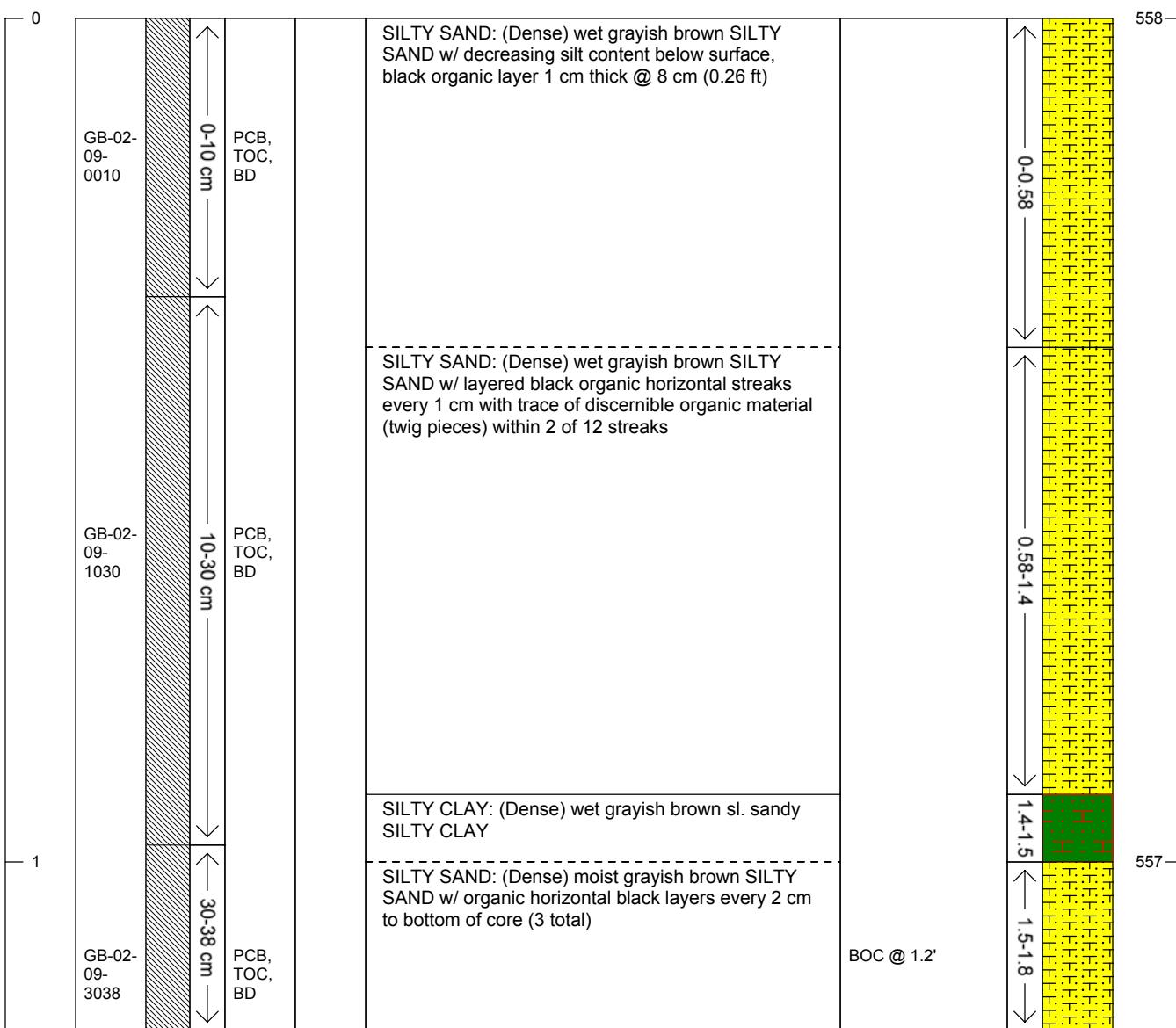


# Sediment Core Log

Core: GB-02-09

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.8 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>21</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>558 ft</b>	Recovery in ft (%): <b>1.2 (67)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>298068</b>	E./LONG: <b>2507745</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-09

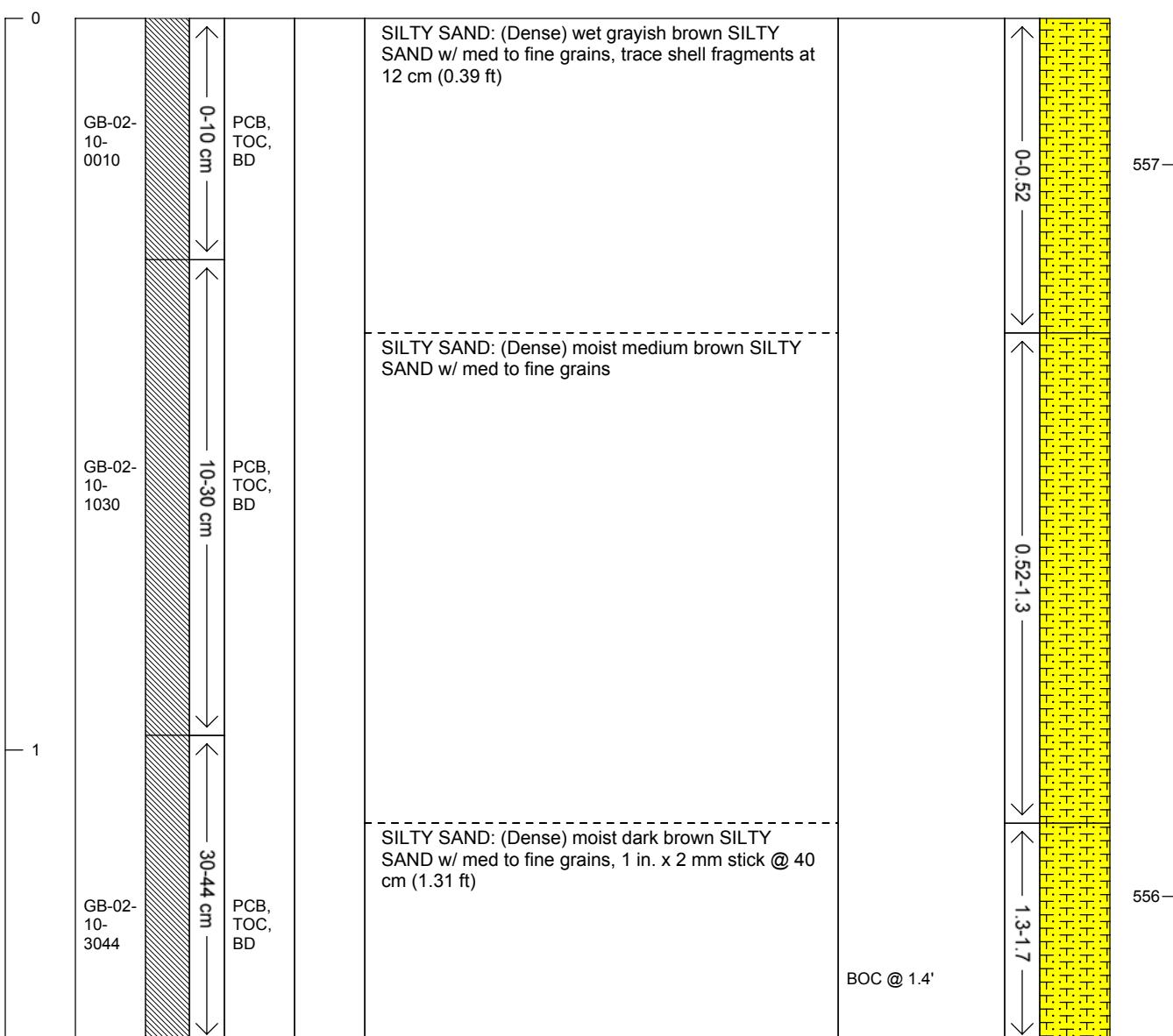


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-10

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.7 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>21.8</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>557.2 ft</b>	Recovery in ft (%): <b>1.4 (82)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>298970</b> E./LONG: <b>2513083</b>	Process Date: <b>7/25/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-10

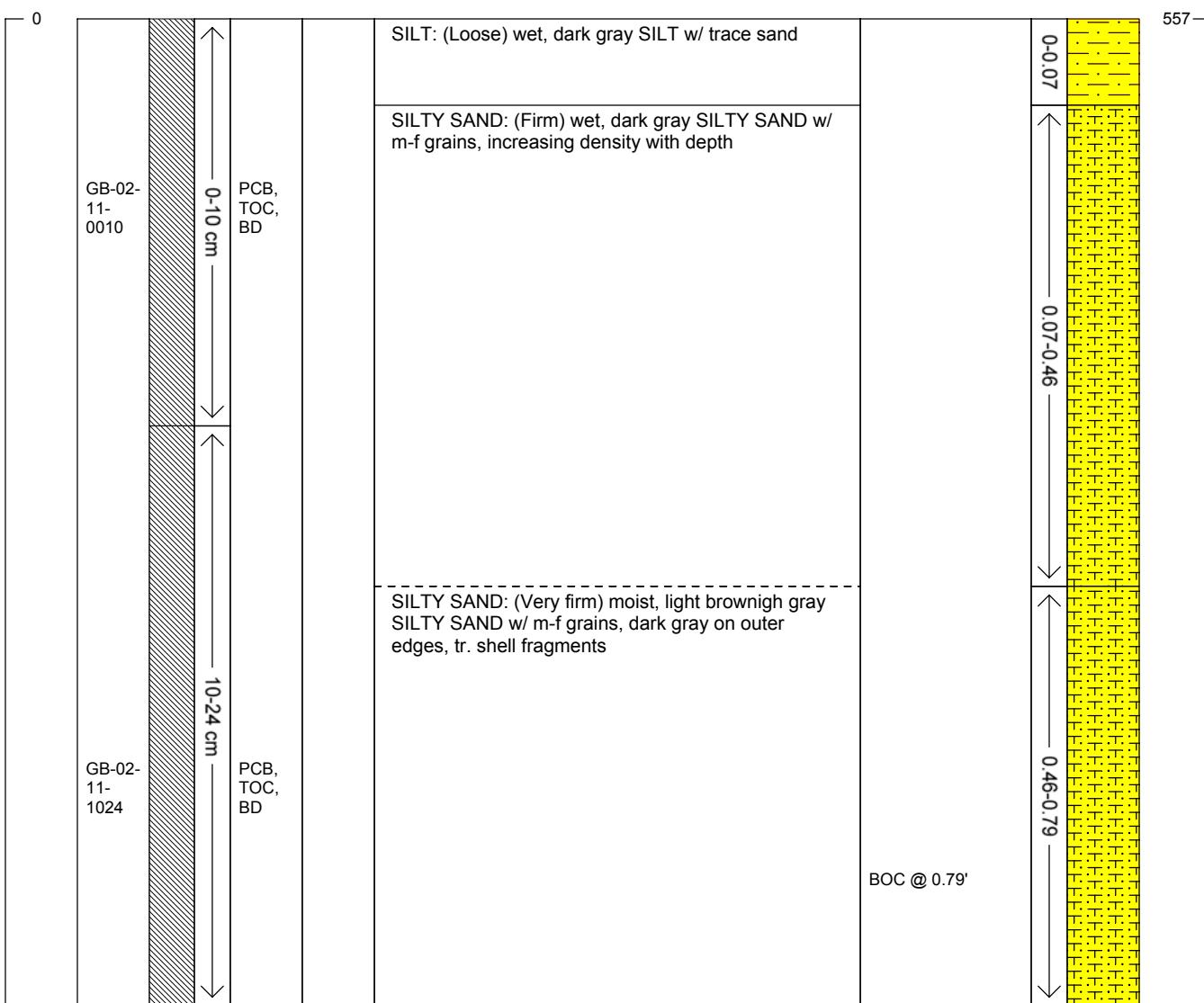


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-11

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.8 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>22</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>557 ft</b>	Recovery in ft (%): <b>0.8 (100)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>302129</b>	E./LONG: <b>2515476</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Sampled from 0-10 and 10-24 TOC, PCB, bulk density

Calculated Recovery  
Sample Length/Penetration Length:  
**0.8 / 0.8 ft = 100 %**



GB-02-11

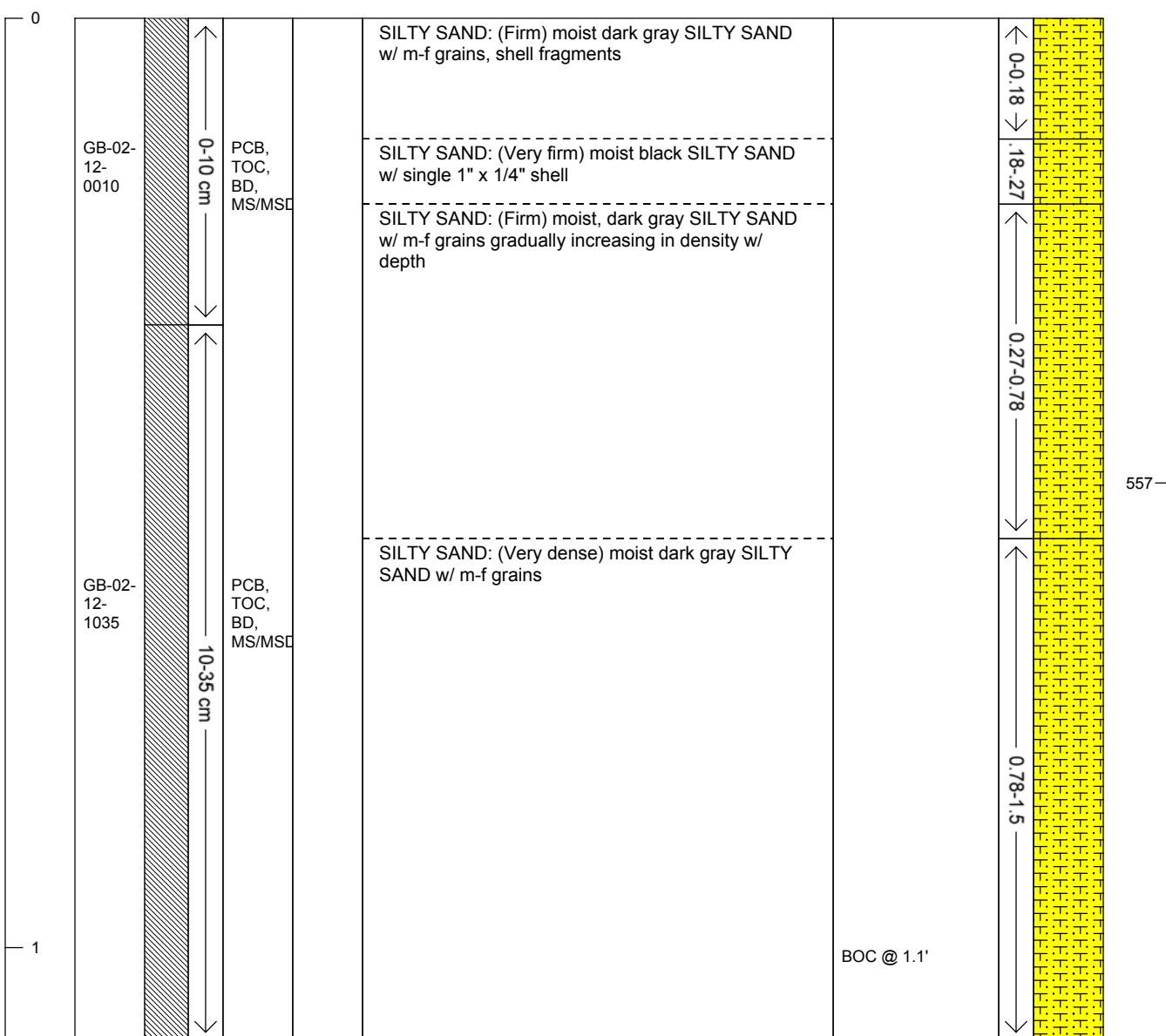


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-12

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>21.5</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>557.5 ft</b>	Recovery in ft (%): <b>1.1 (73)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>302509</b>	E./LONG: <b>2511665</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



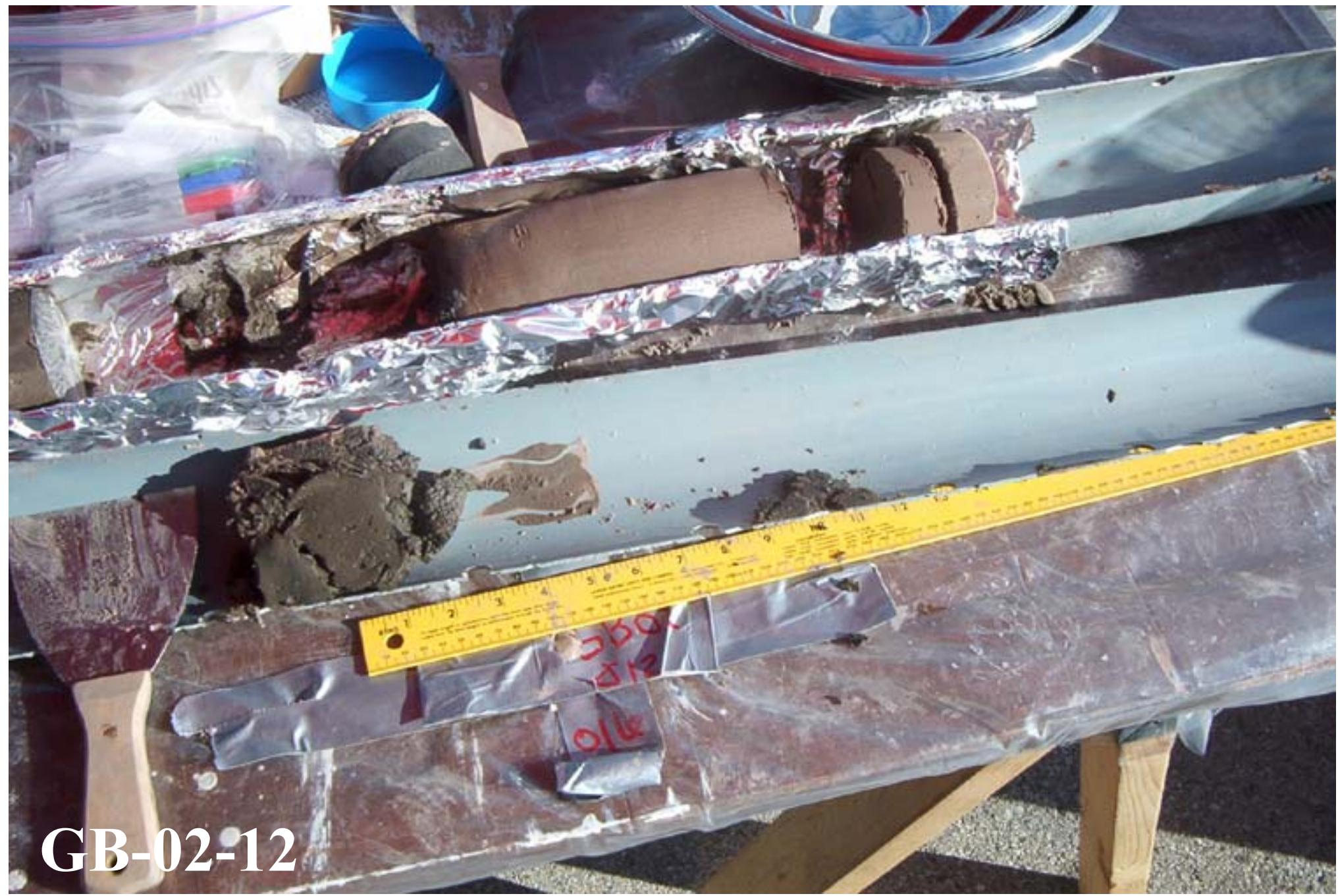
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: MS/MSD collected from each increment

PCB, TOC and bulk density

Calculated Recovery  
Sample Length/Penetration Length:

$$1.1 / 1.5 = 73 \%$$



GB-02-12

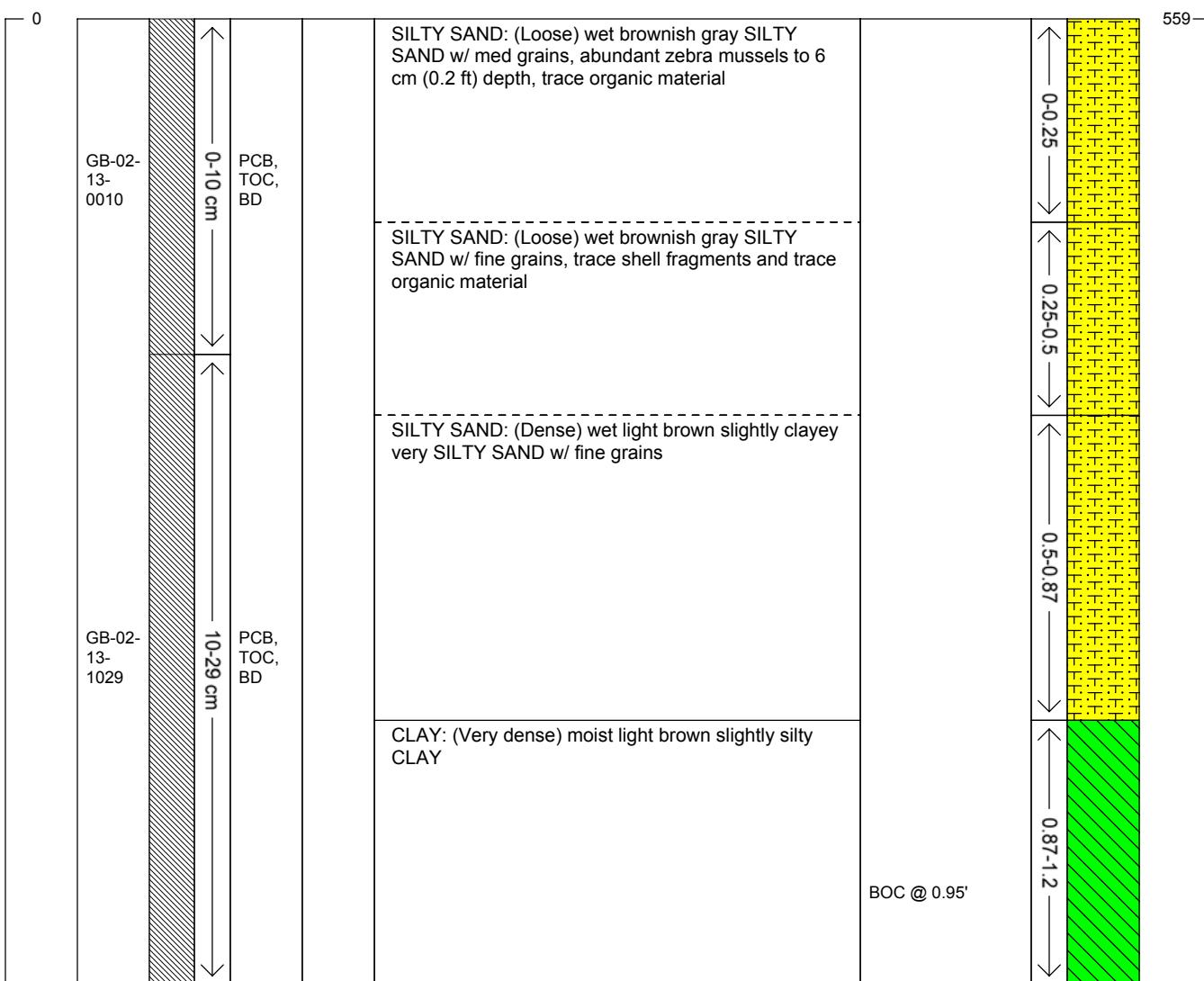


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-13

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.2 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>20</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>559 ft</b>	Recovery in ft (%): <b>0.95 (79)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>289325</b>	E./LONG: <b>2502549</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Process Method: <b>Extrude</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	<b>Sediment Description</b> Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: PCB, TOC and bulk density

**Calculated Recovery**  
Sample Length/Penetration Length:

 $0.95/1.2 \text{ ft} = 79\%$



GB-02-13

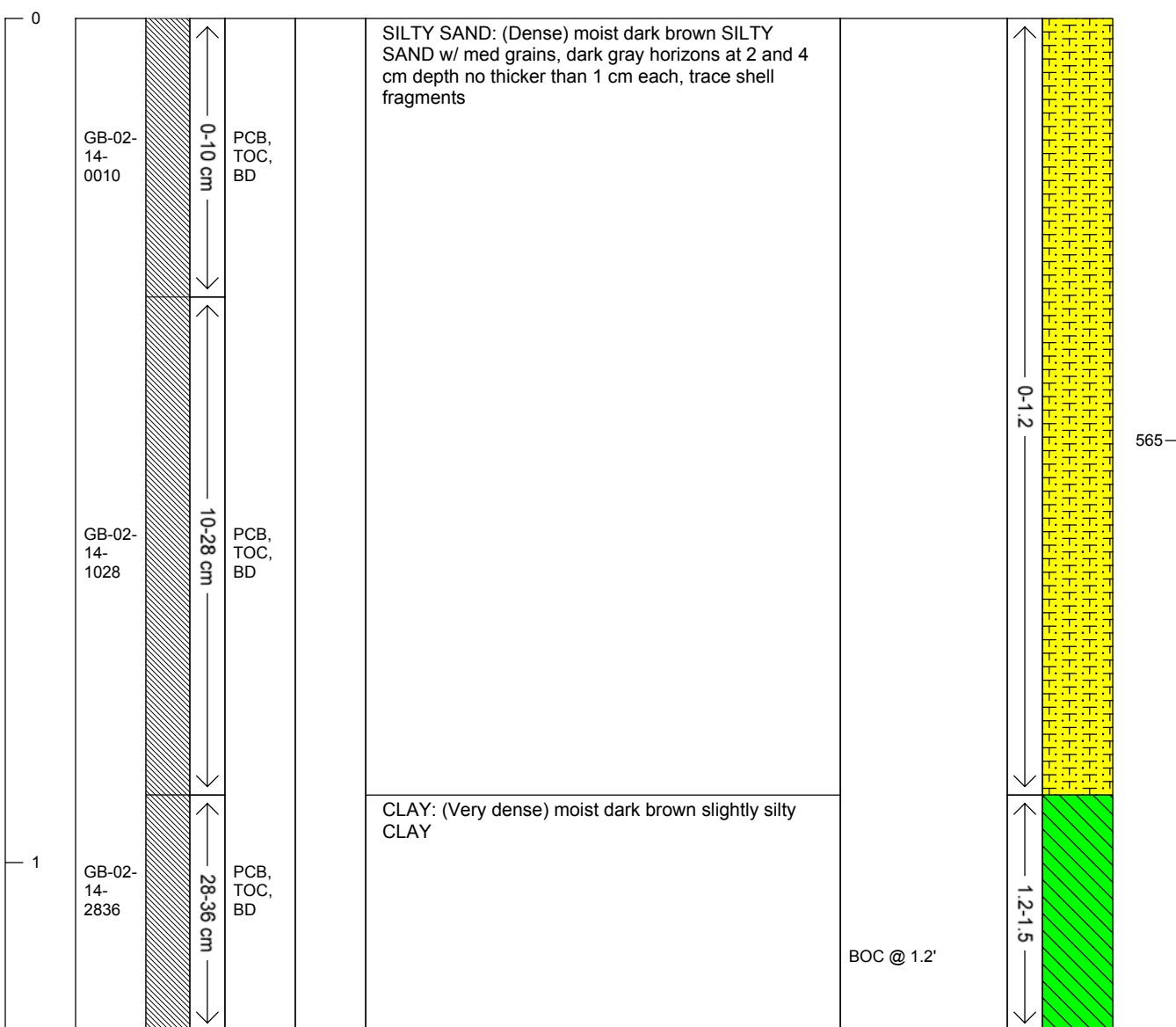


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-14

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>13.5</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>565.5 ft</b>	Recovery in ft (%): <b>1.2 (80)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>280975</b>	E./LONG: <b>2504341</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-14

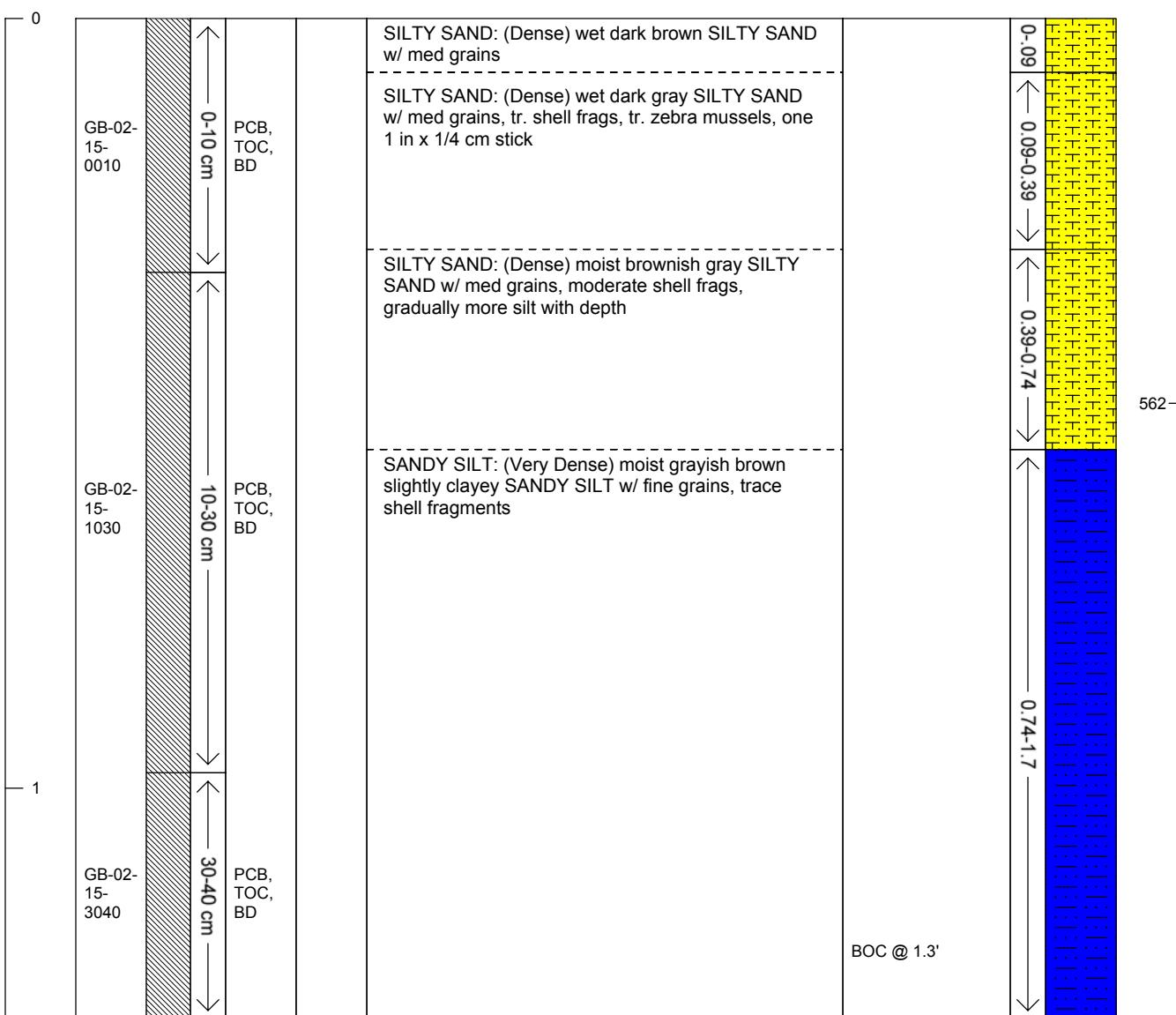


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-15

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.7 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>16.5</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>562.5 ft</b>	Recovery in ft (%): <b>1.3 (76)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>282145</b>	E./LONG: <b>2508386</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: TOC, PCB and bulk density from each increment

Calculated Recovery  
Sample Length/Penetration Length:  
 $1.3 / 1.7 \text{ ft} = 76 \%$



GB-02-15



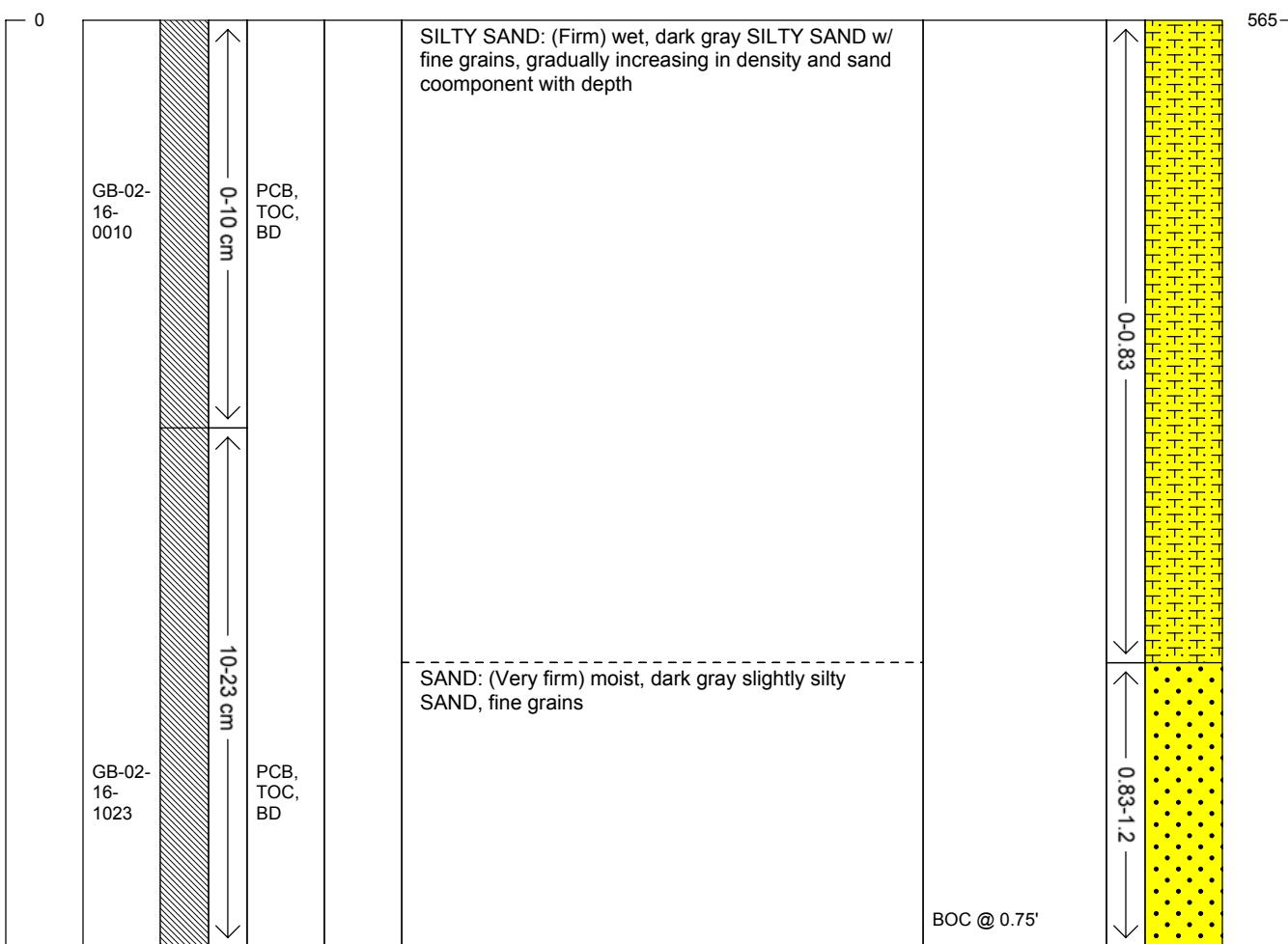
# Sediment Core Log

Sheet 1 of 1

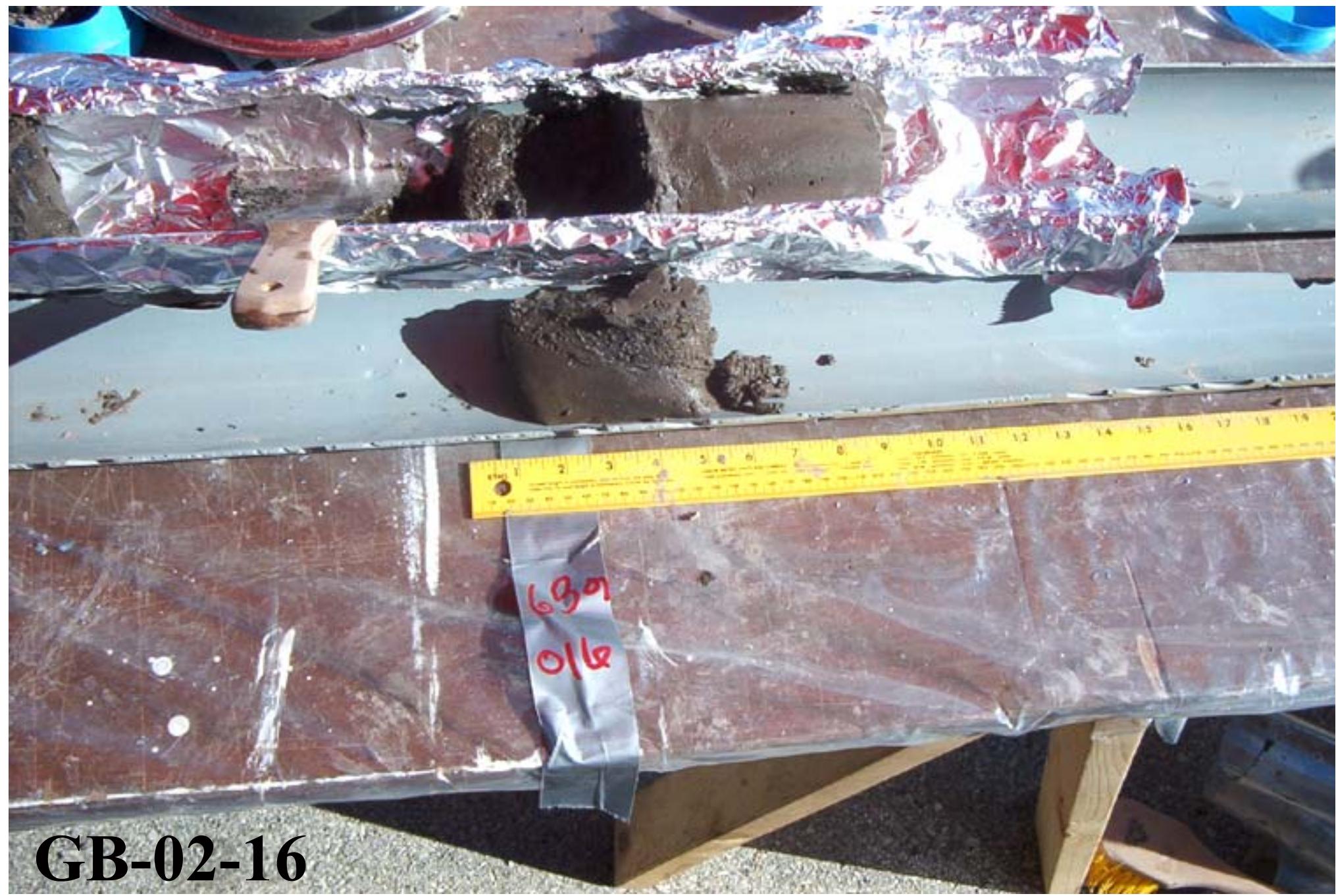
Core: GB-02-16

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.75</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>14</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>565 ft</b>	Recovery in ft (%): <b>0.75 (63)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>283097</b>	E./LONG: <b>2496950</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Process Method: <b>Extrude</b>
		Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc. 1011 SW Klickitat Way, Suite 207 Seattle, WA 98134-1162 Phone: (206) 624-9349 Fax: (206) 624-2839	Remarks: <u>23 cm after extrusion</u> <u>PCB, TOC and bulk density for each increment</u>	Calculated Recovery Sample Length/Penetration Length: <u>0.75/1.2 ft= 63 %</u>
---	--	--



**GB-02-16**



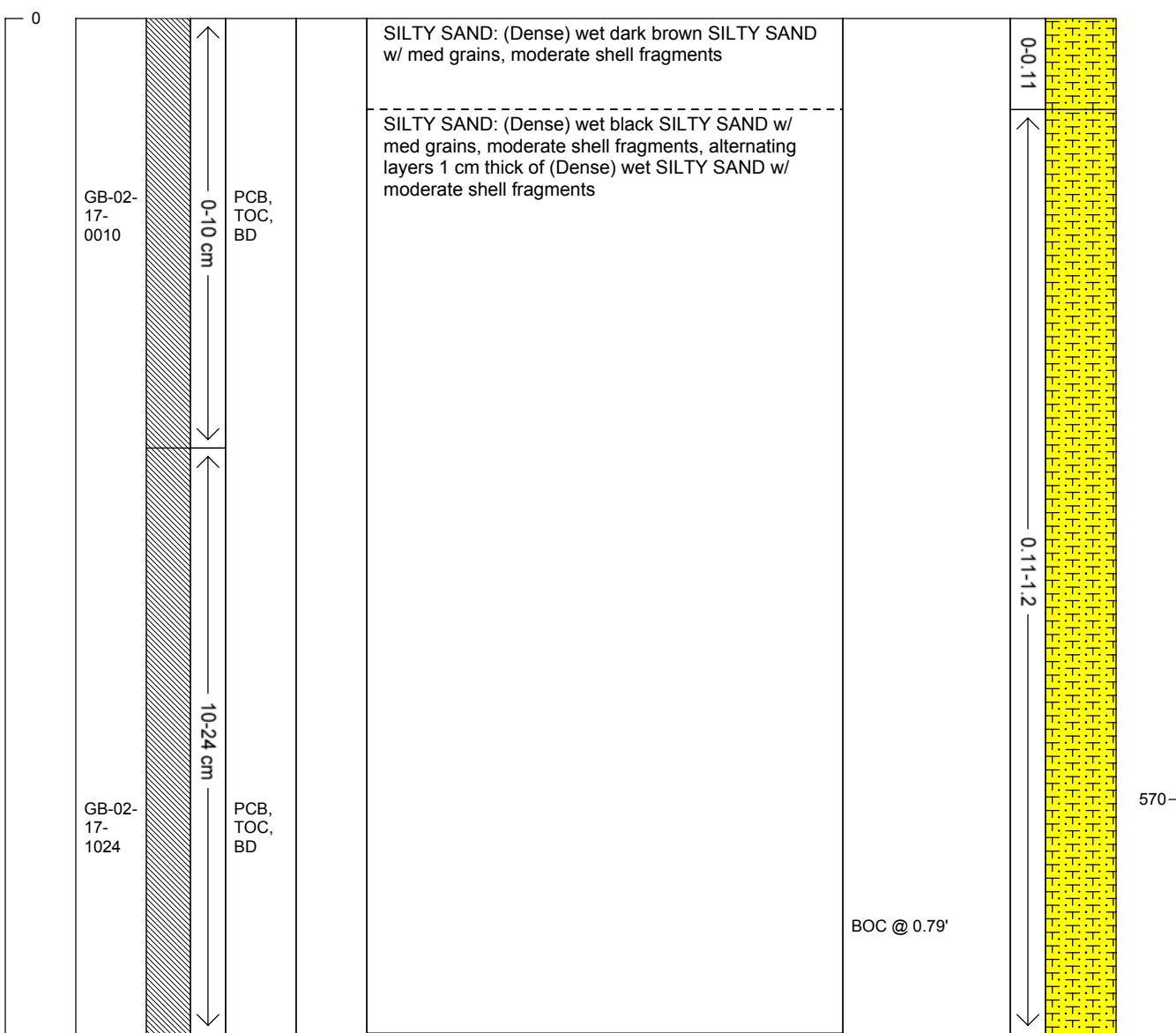
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-17

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.2 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>8.4</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/23/2002</b>	Mudline Elevation (ft): <b>570.6 ft</b>	Recovery in ft (%): <b>0.78 (65)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>277446</b>	E./LONG: <b>2496629</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Process Method: <b>Extrude</b>
		Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: TOC, PCB and BD sampled from both increments

Calculated Recovery  
Sample Length/Penetration Length:  
 $0.78 / 1.2 \text{ ft} = 65\%$



6B 02  
017

GB-02-17

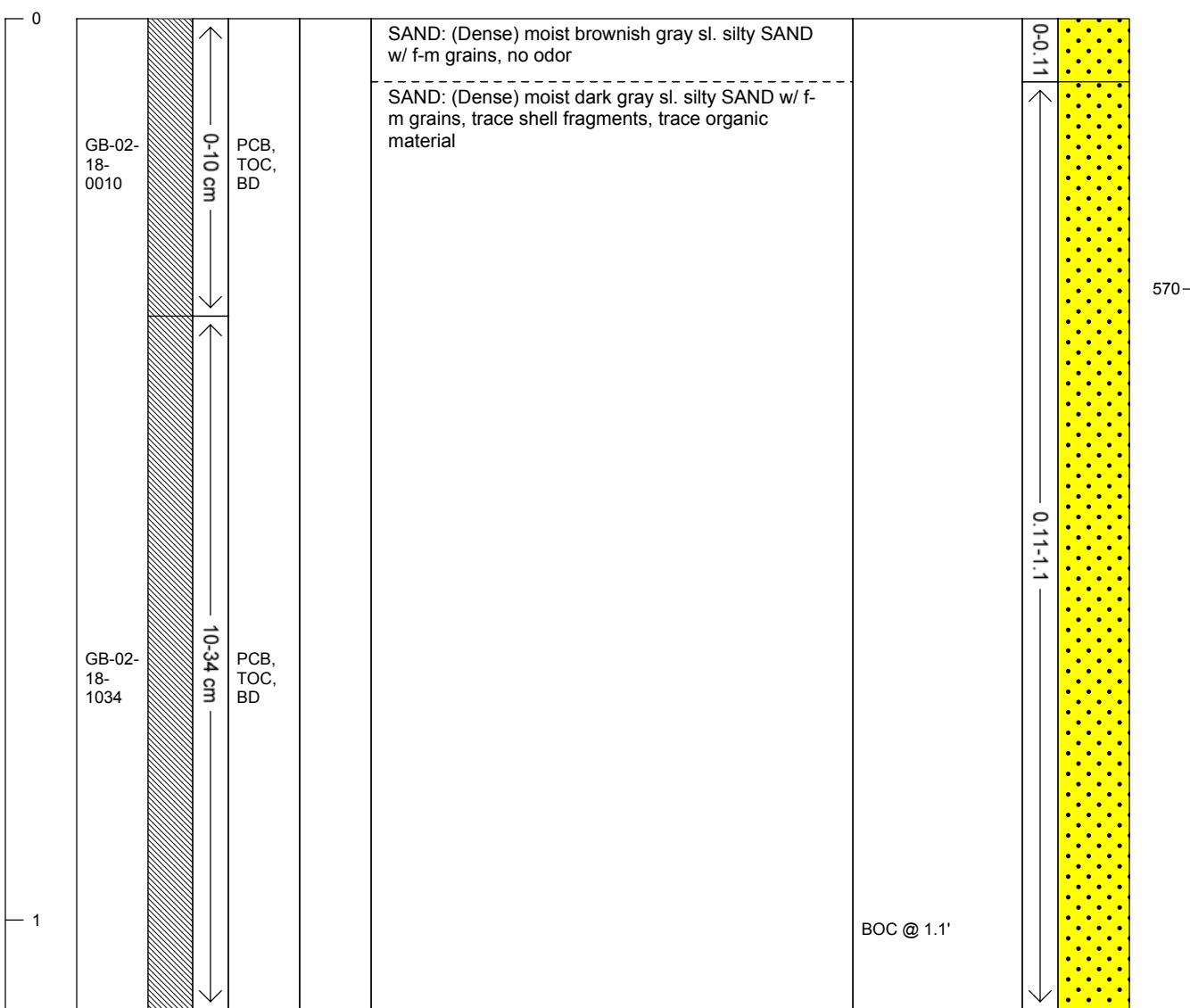


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-18

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.1</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>8.7</b>	Sample Quality: <b>fair</b>					
Collection Date: <b>7/23/2002</b>		Mudline Elevation (ft): <b>570.3 ft</b>	Recovery in ft (%): <b>1.1 (100)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>278088</b> E./LONG: <b>2494704</b>	Process Date: <b>7/23/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



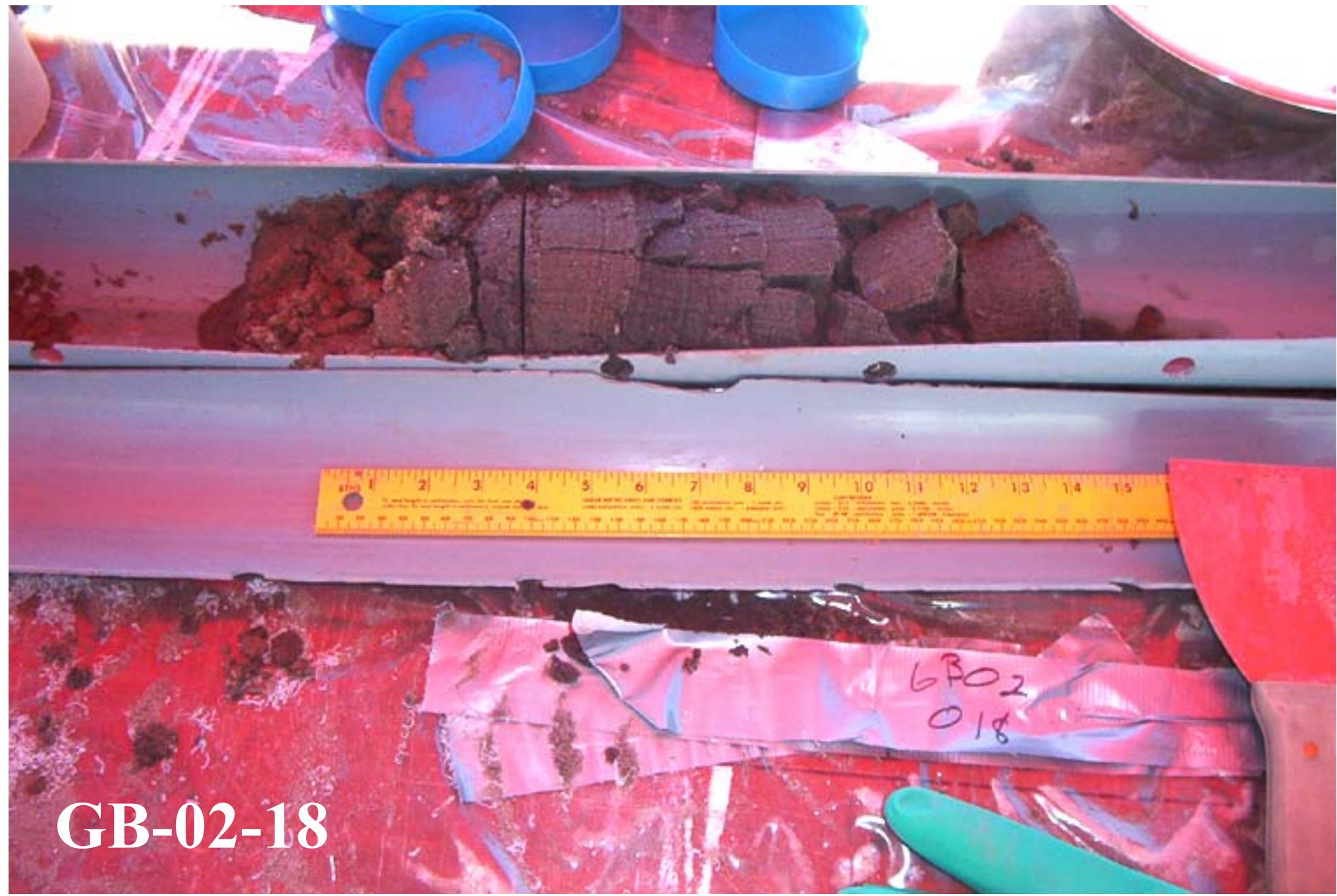
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: 2 sections - 0-10 and 10-34 for TOC, PCB and bulk density

Calculated Recovery

Sample Length/Penetration Length:

1.1 / 1.1 ft = 100 %



GB-02-18

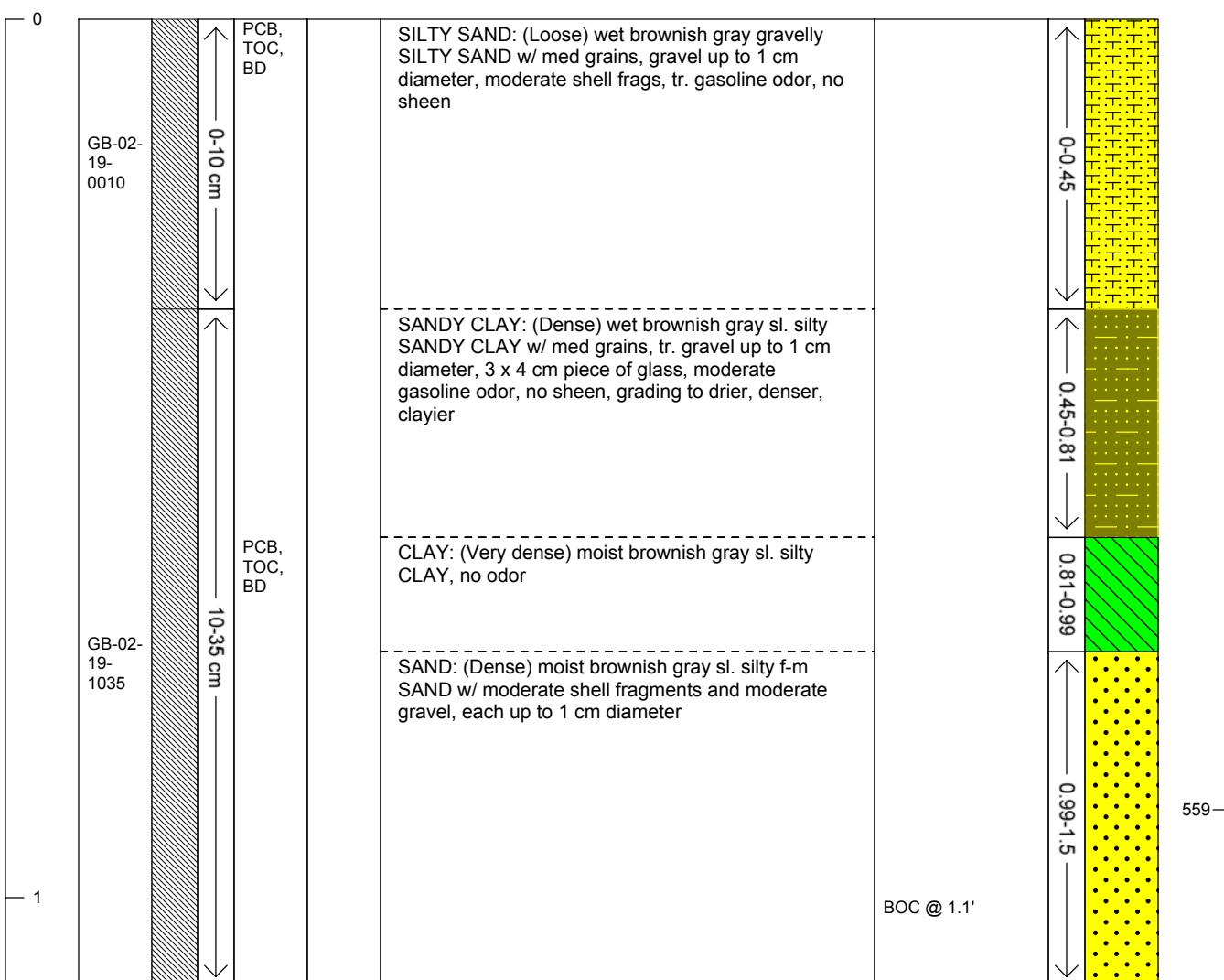


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-19

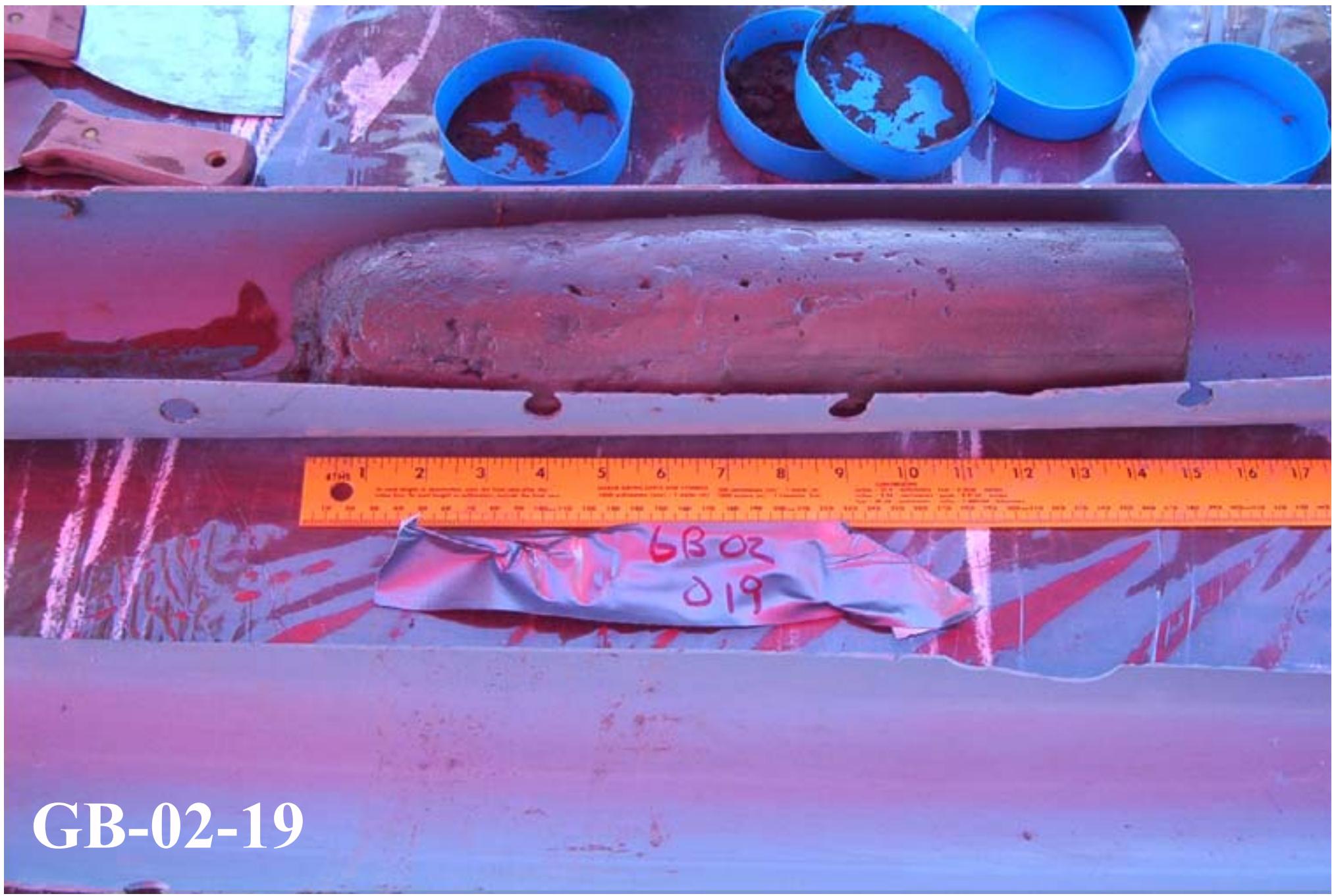
Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>19.1</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>559.9 ft</b>	Recovery in ft (%): <b>1.1 (73)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>282165</b> E./LONG: <b>2500443</b>	Process Date: <b>7/24/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Slight gasoline odor 0-10, moderate gas odor 10-18 cm

Calculated Recovery  
Sample Length/Penetration Length:  
**1.1 / 1.5 ft = 73 %**



GB-02-19

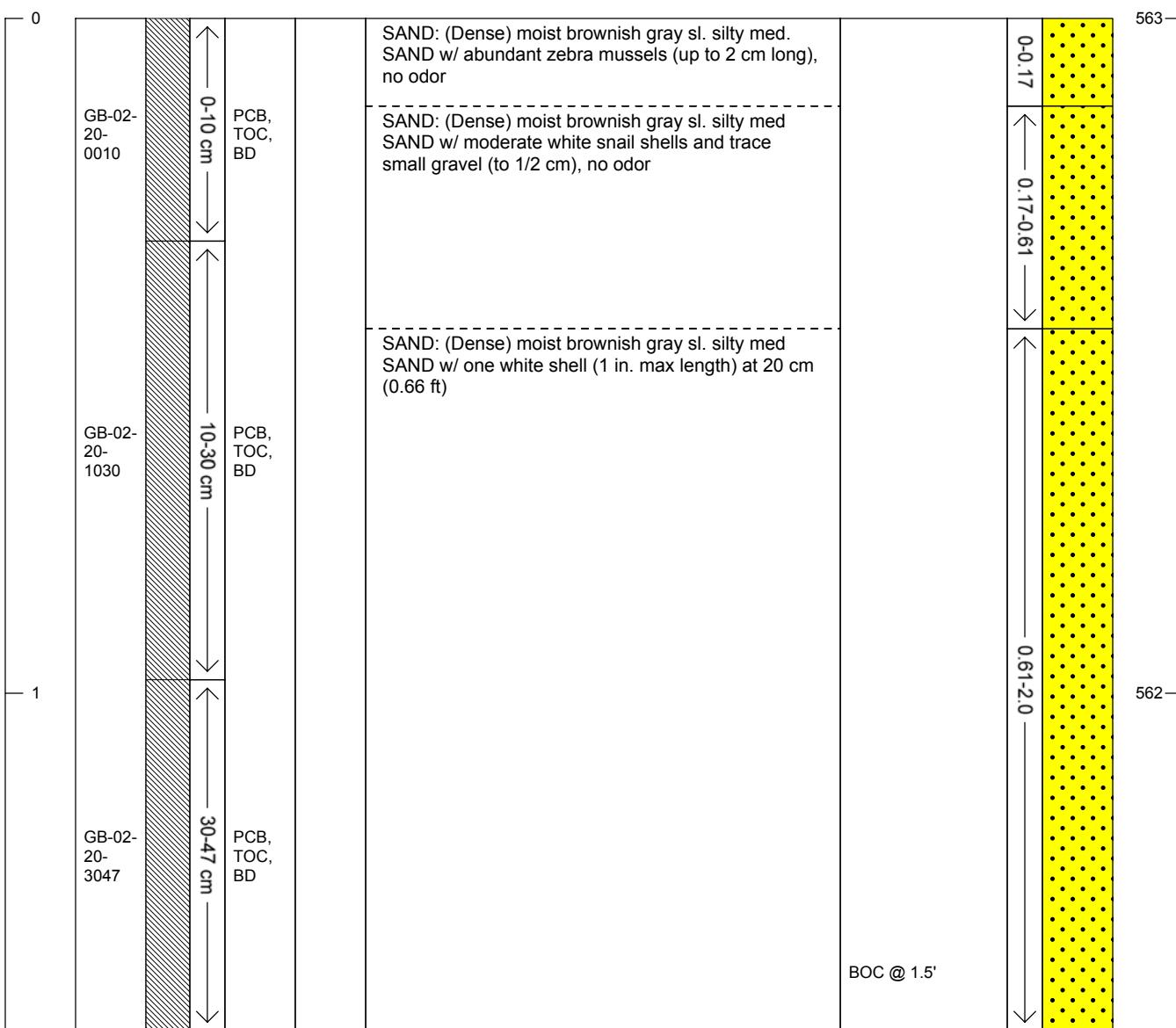


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-20

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>16</b>	Sample Quality: <b>poor</b>						
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>563 ft</b>	Recovery in ft (%): <b>1.5 (75)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>278884</b>	E./LONG: <b>2500025</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-20



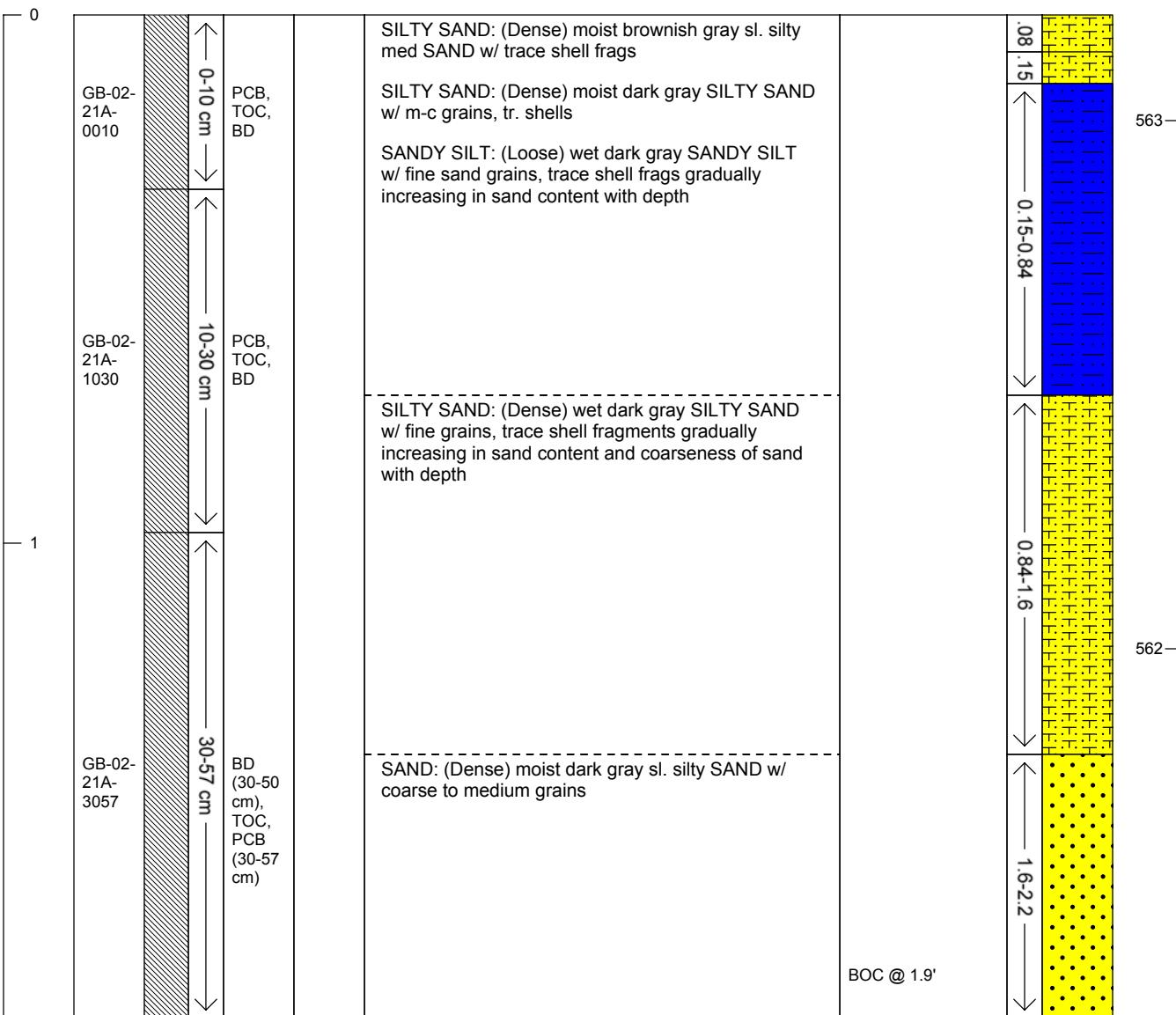
# Sediment Core Log

Core: GB-02-21A

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.2 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>15.8</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>563.2 ft</b>	Recovery in ft (%): <b>1.9 (86)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>283191</b> E./LONG: <b>2504998</b>	Process Date: <b>7/24/2002</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

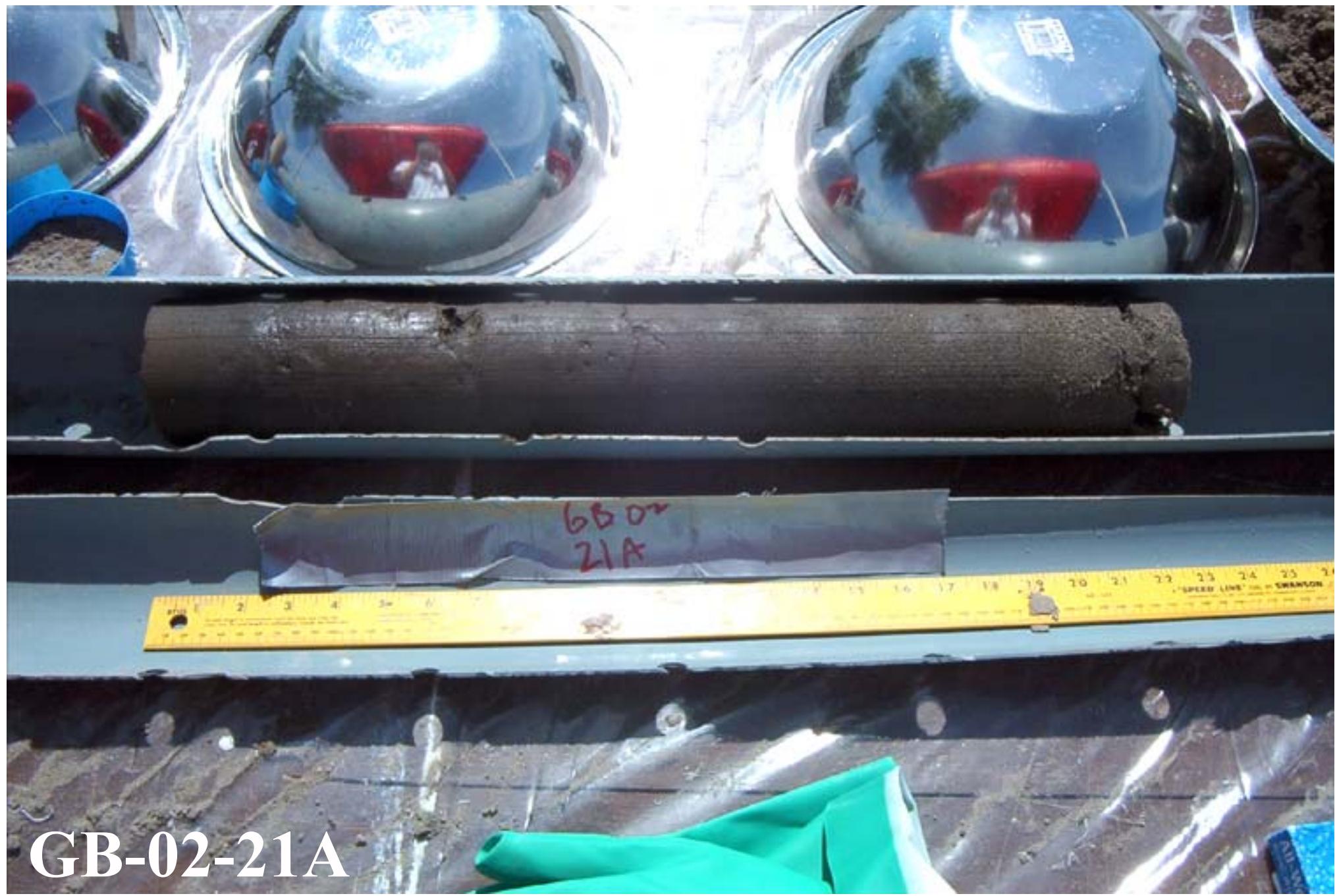
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)
-----------------------------	----------	---------------------------	----------	------------------	--	----------	---	---------------------------



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density 30-50 cm, TOC, PCB 30-57 cm

Calculated Recovery  
Sample Length/Penetration Length:  
1.9 / 2.2 ft = 86 %



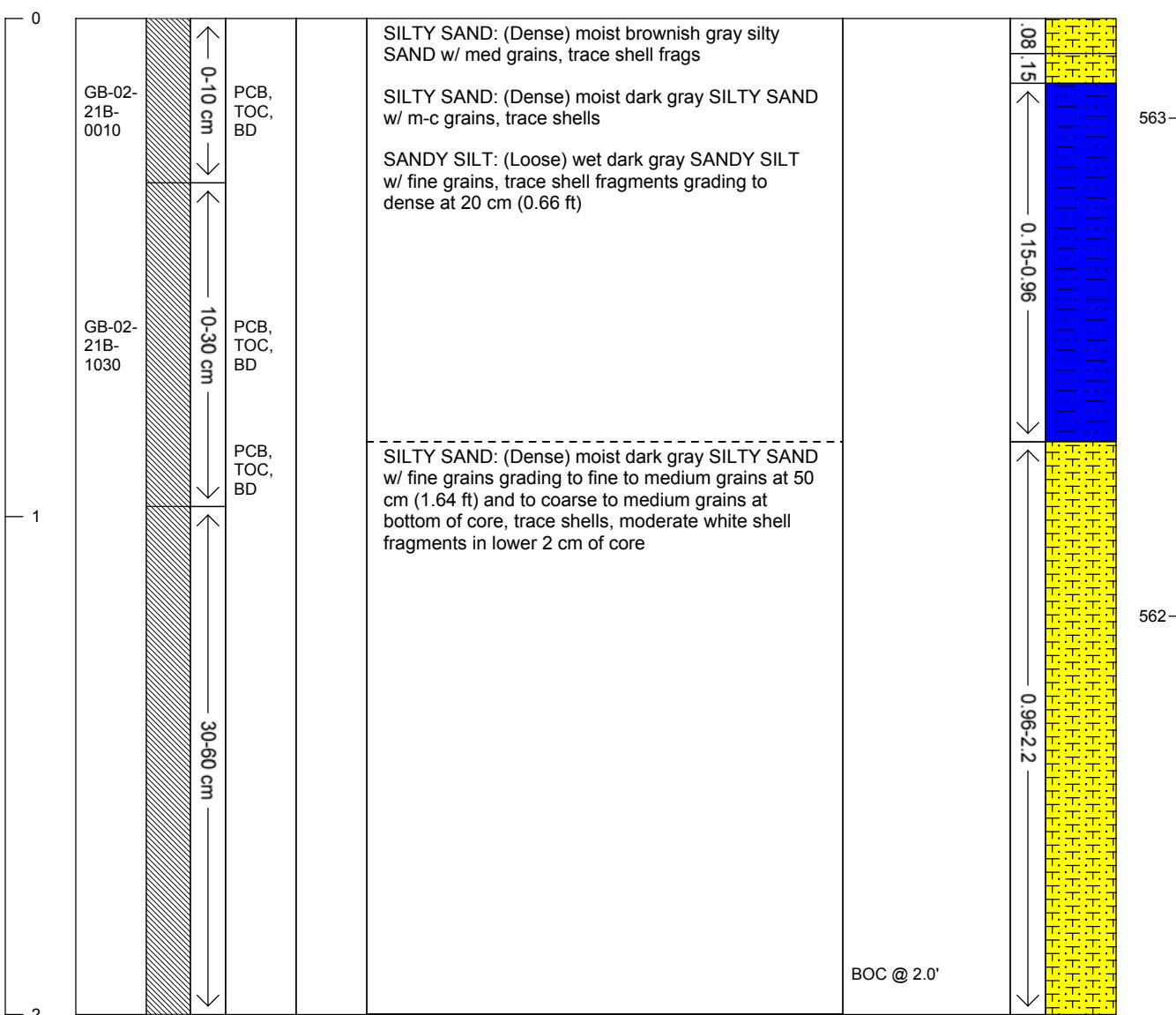


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-21B

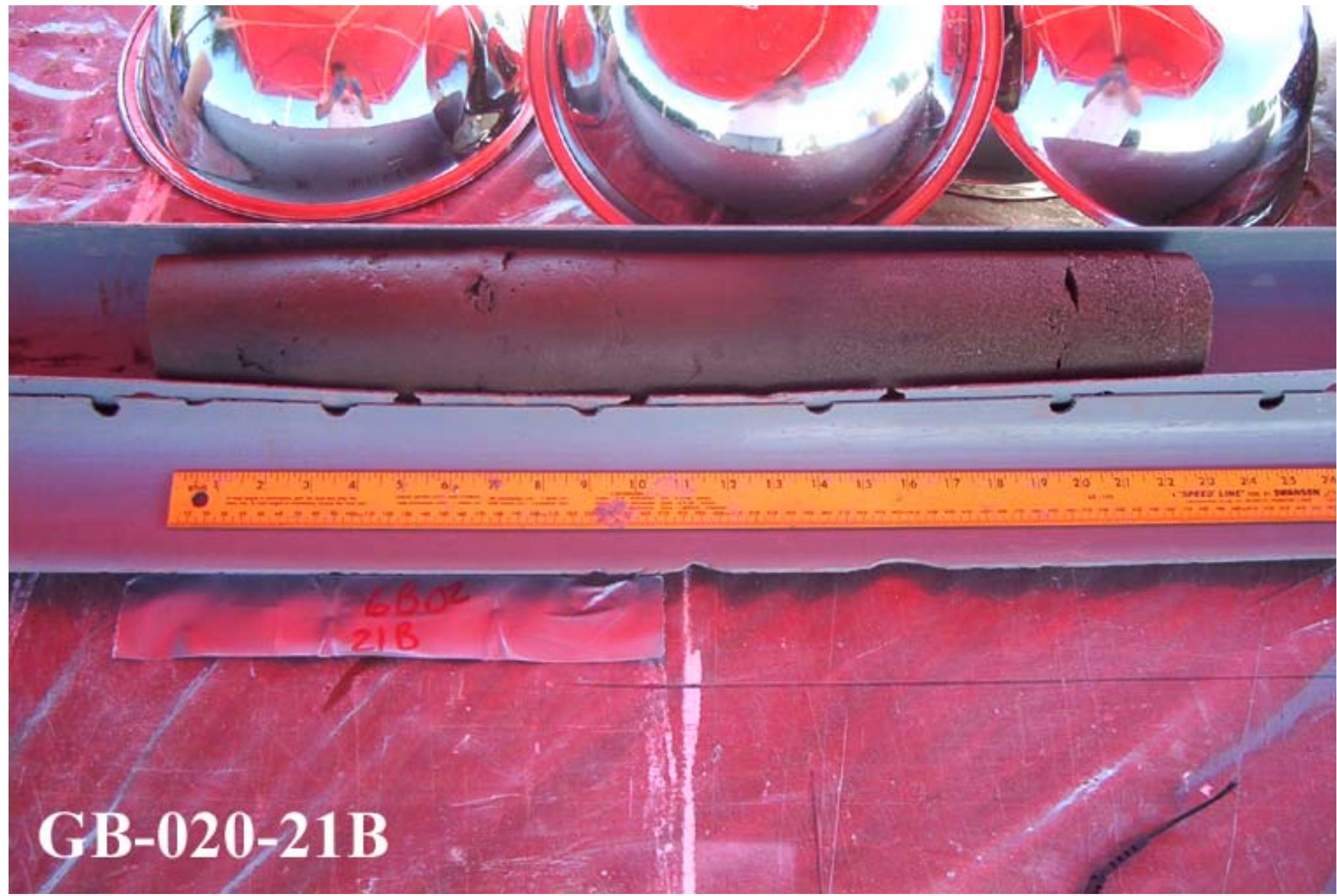
Project: Green Bay Supp. Sed. Samp.	Water Body Type: Lacustrine	Tube Length: 6.0 ft						
Project #: WISCN-16040-100	SW Elevation (ft)/Tide: 579 ft	Penetration Depth: 2.2 ft						
Client: WDNR	Water Depth (ft): 15.8	Sample Quality: good						
Collection Date: 7/24/2002	Mudline Elevation (ft): 563.2 ft	Recovery in ft (%): 2.0 (90)						
Contractor: RETEC	N./LAT: 283191 E./LONG: 2504998	Process Date: 7/24/2002						
Vessel: 25' sampling boat	Horiz. Datum: NAD 83 Vert. Datum: IGLD 85	Process Method: Extrude						
Operator: Superior Services	Method/Tube ID: Diver assited 3 in. push core	Logged By: Dan Berlin						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Duplicate of GB-02-21A  
Duplicate analysis for top 2 sections  
Bulk density and PCB, TOC from 0-10 and 10-30 cm

Calculated Recovery  
Sample Length/Penetration Length:  
2.0 / 2.2 ft = 90 %





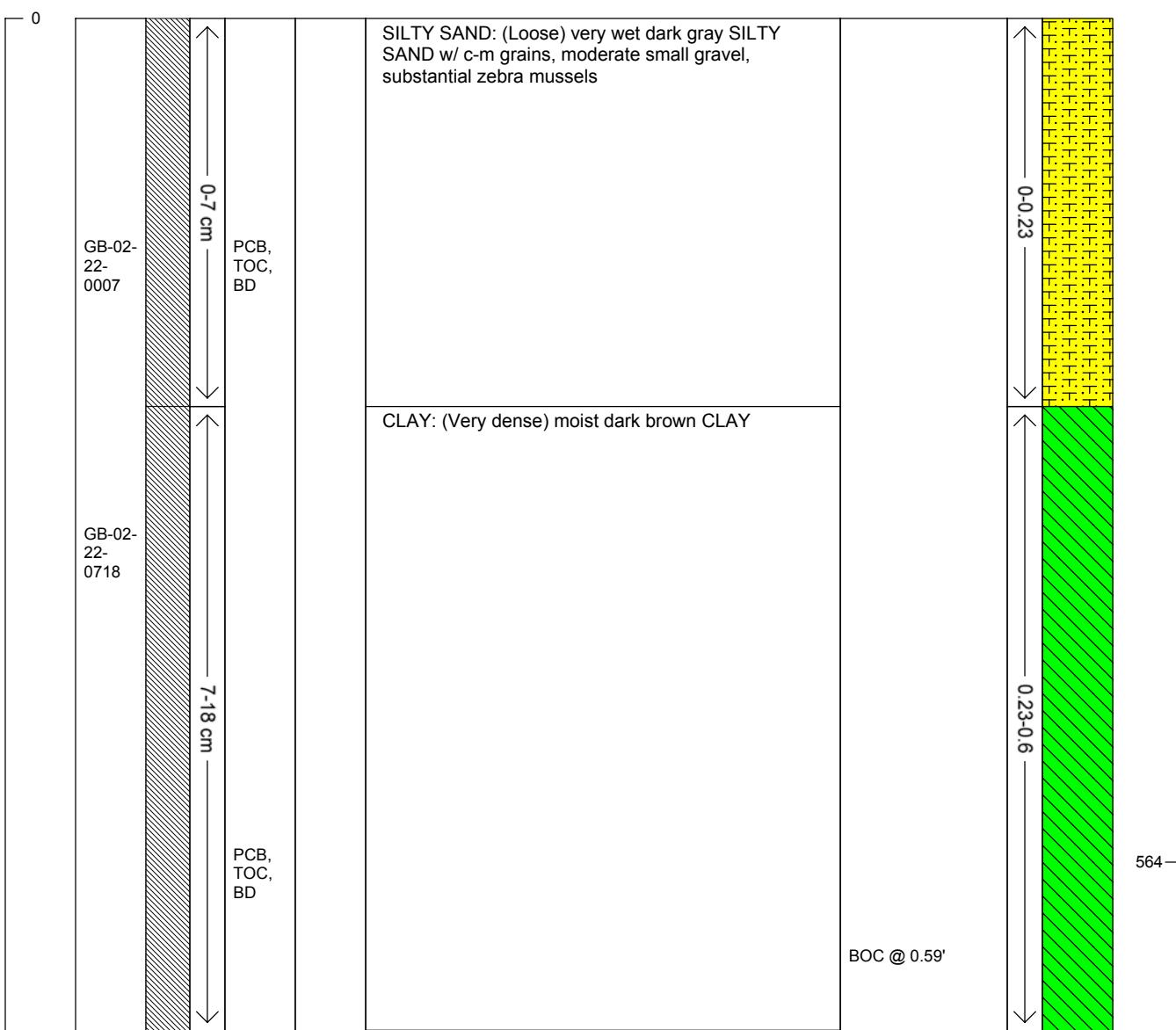
# Sediment Core Log

Core: GB-02-22

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.6 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>14.5</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>564.5 ft</b>	Recovery in ft (%): <b>0.6 (100)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>283064</b>	E./LONG: <b>2510999</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Process Method: <b>Extrude</b>
		Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Hard contact @ 7 cm

Calculated Recovery  
Sample Length/Penetration Length:  
 $0.6 / 0.6 \text{ ft} = 100\%$



GB-02-22

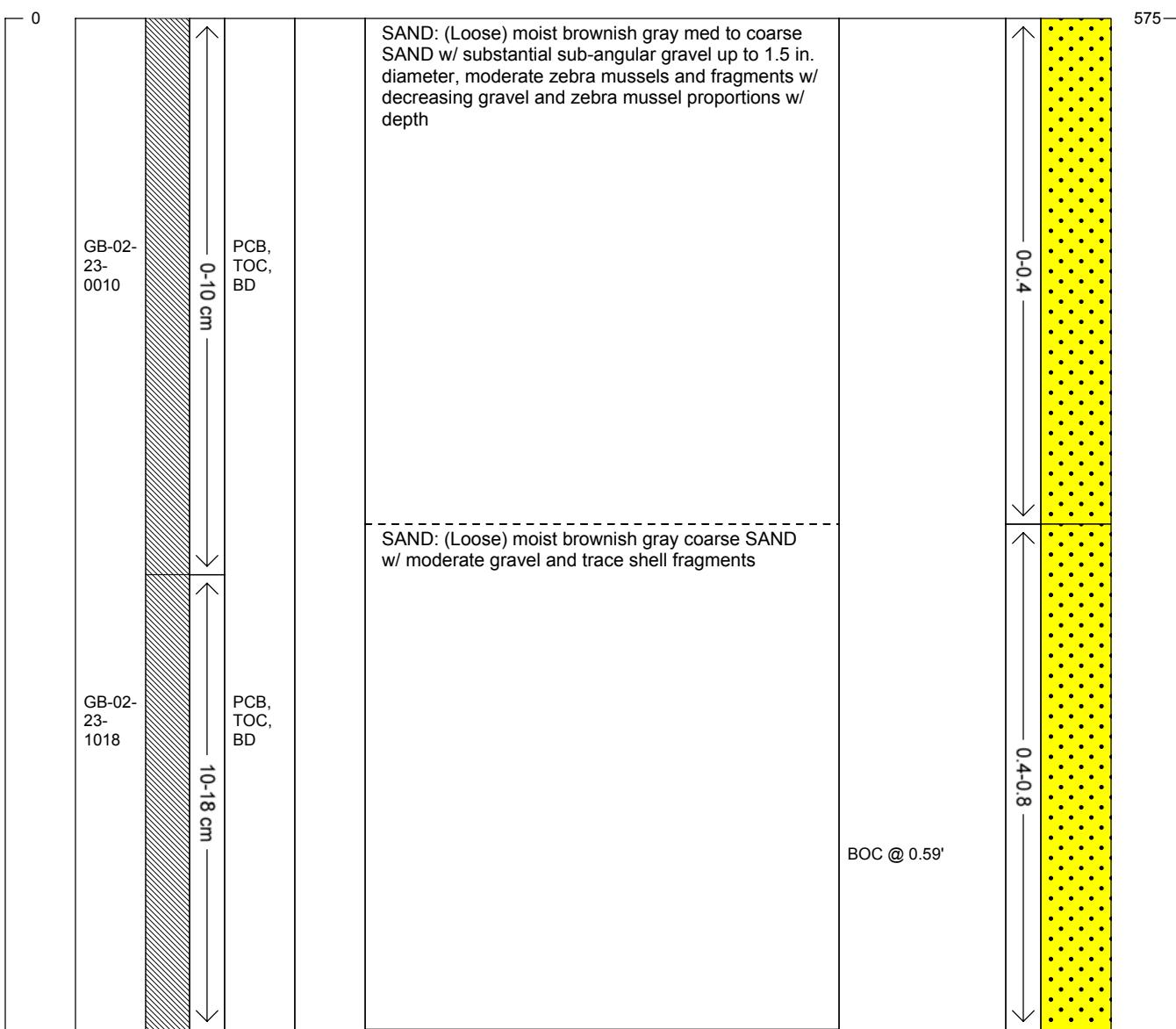


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-23

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.8 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>4</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>575 ft</b>	Recovery in ft (%): <b>0.6 (75)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>278105</b>	E./LONG: <b>2508387</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-23

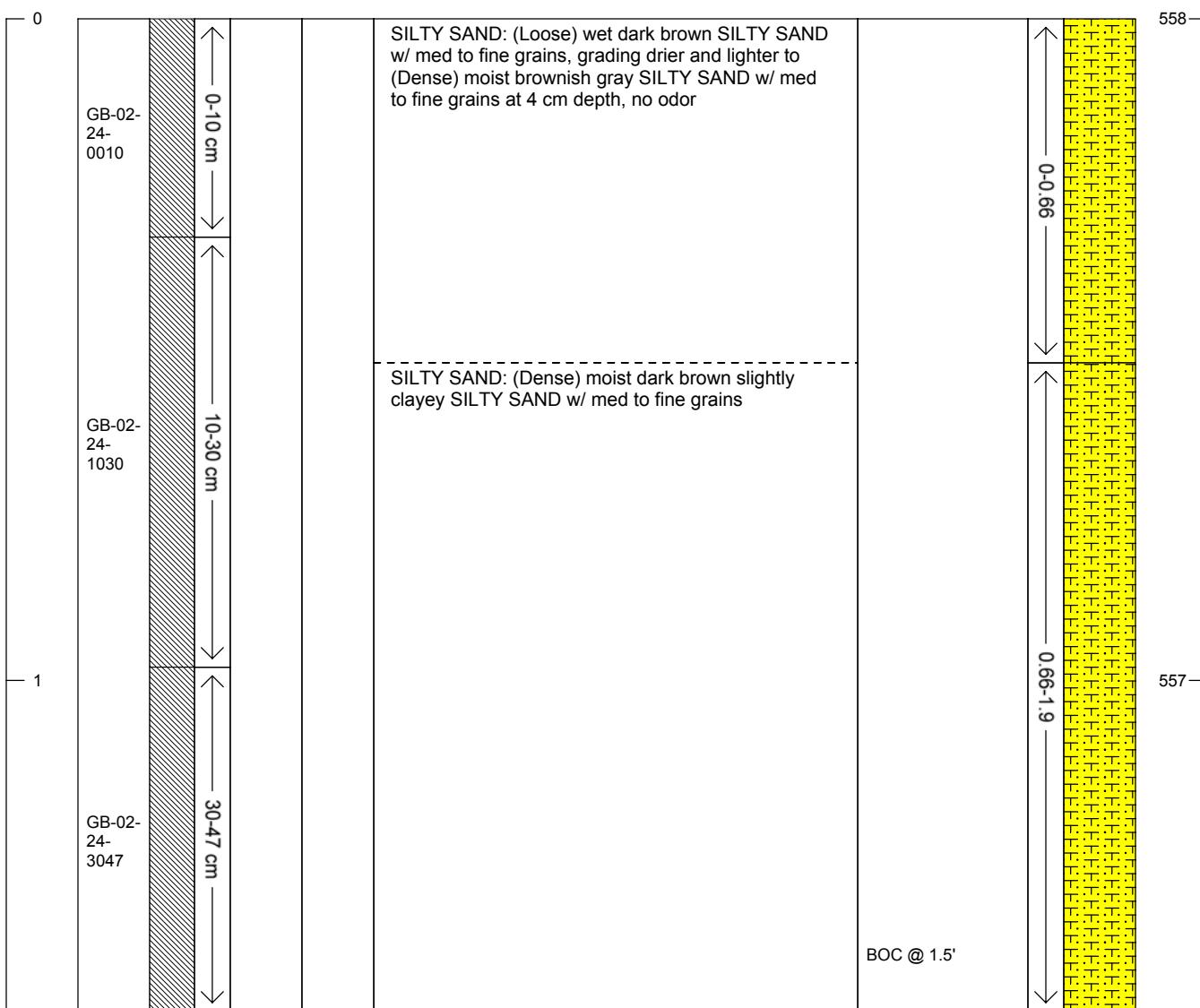


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-24

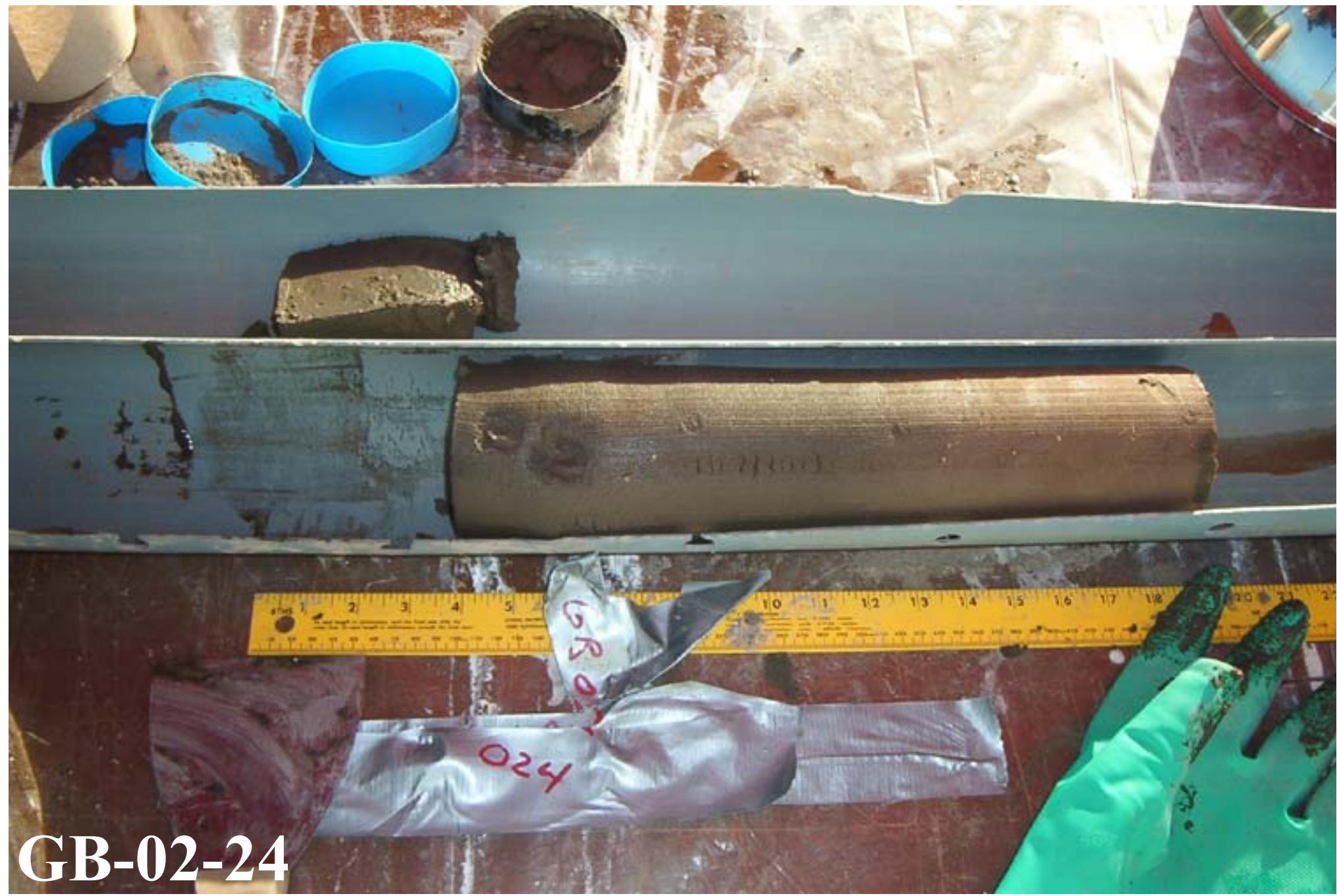
Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.9 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>21</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>558 ft</b>	Recovery in ft (%): <b>1.5 (79)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>294678</b>	E./LONG: <b>2509047</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: 3 incremental samples

Calculated Recovery  
Sample Length/Penetration Length:  
 $1.5 / 1.9 \text{ ft} = 79 \%$



GB-02-24

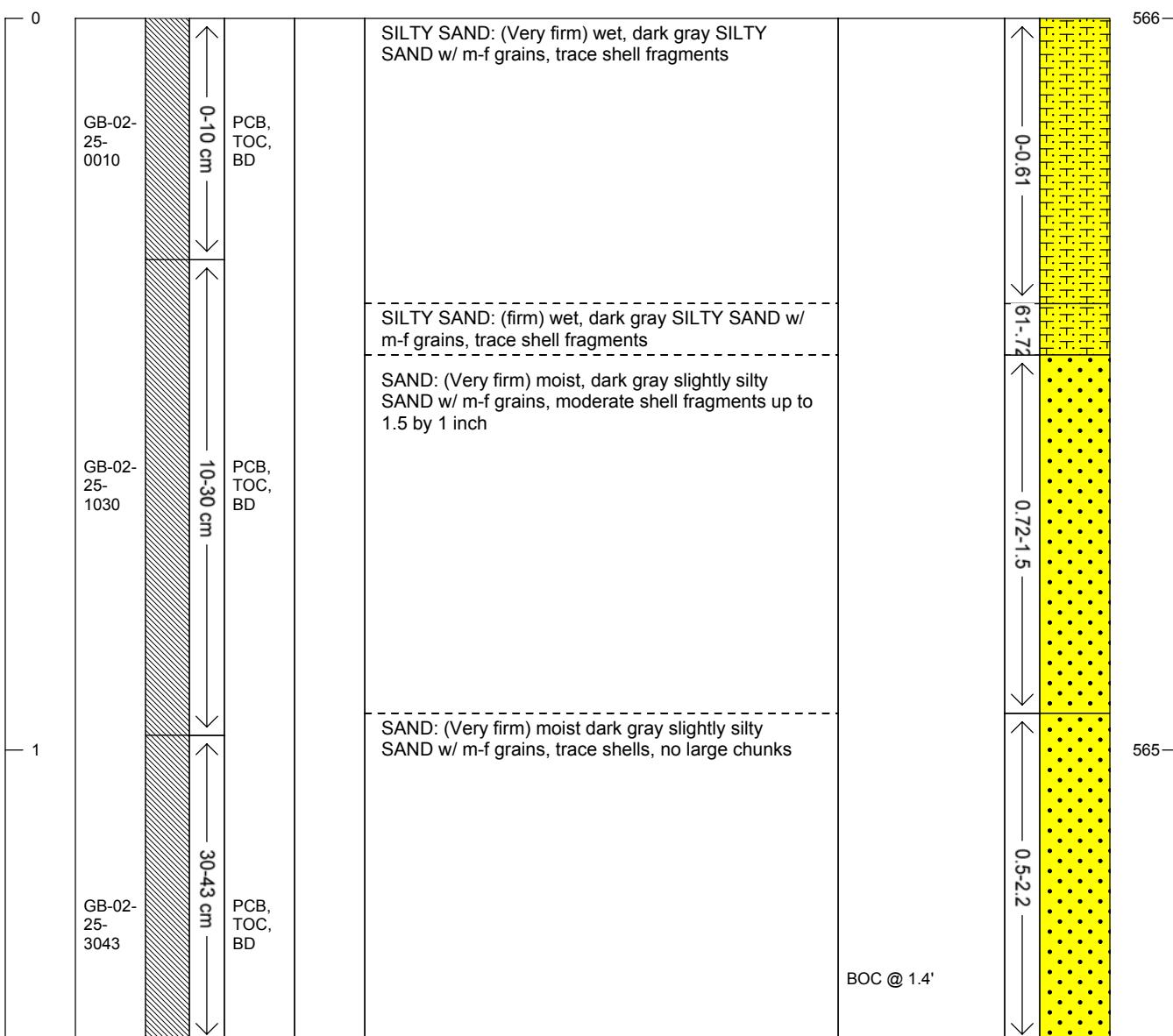


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-25

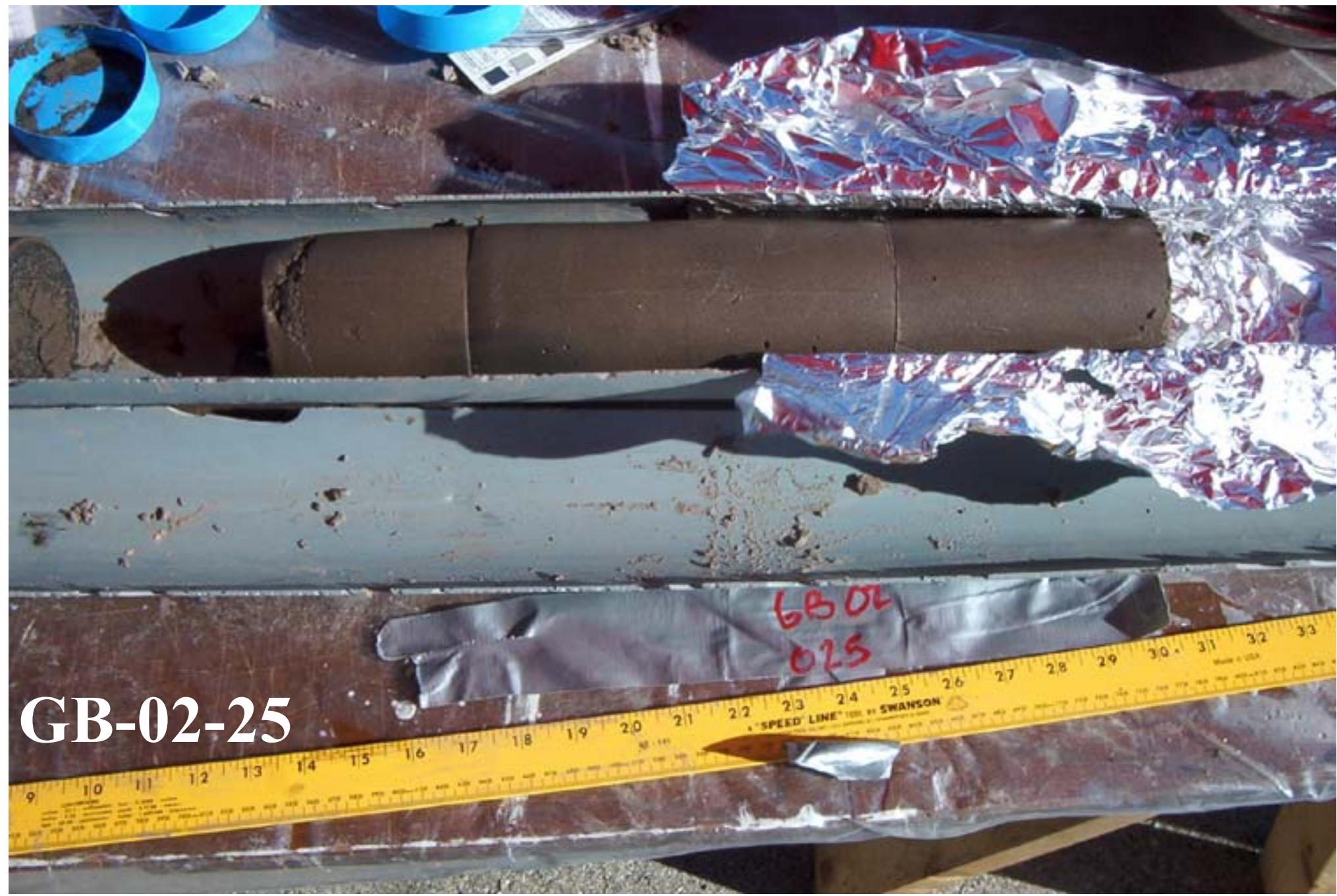
Project: Green Bay Supp. Sed. Samp.		Water Body Type: Lacustrine	Tube Length: 6.0 ft					
Project #: WISCN-16040-100		SW Elevation (ft)/Tide: 579 ft	Penetration Depth: 2.2 ft					
Client: WDNR		Water Depth (ft): 13	Sample Quality: good					
Collection Date: 7/22/2002		Mudline Elevation (ft): 566 ft	Recovery in ft (%): 1.4 (64)					
Contractor: RETEC		N./LAT: 285427 E./LONG: 2497190	Process Date: 7/22/2002					
Vessel: 25' sampling boat		Horiz. Datum: NAD 83 Vert. Datum: IGLD 85	Process Method: Extrude					
Operator: Superior Services		Method/Tube ID: Diver assited 3 in. push core	Logged By: Dan Berlin					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density, PCB and TOC from each increment

Calculated Recovery  
Sample Length/Penetration Length:  
 $1.4 / 2.2 = 64\%$



GB-02-25

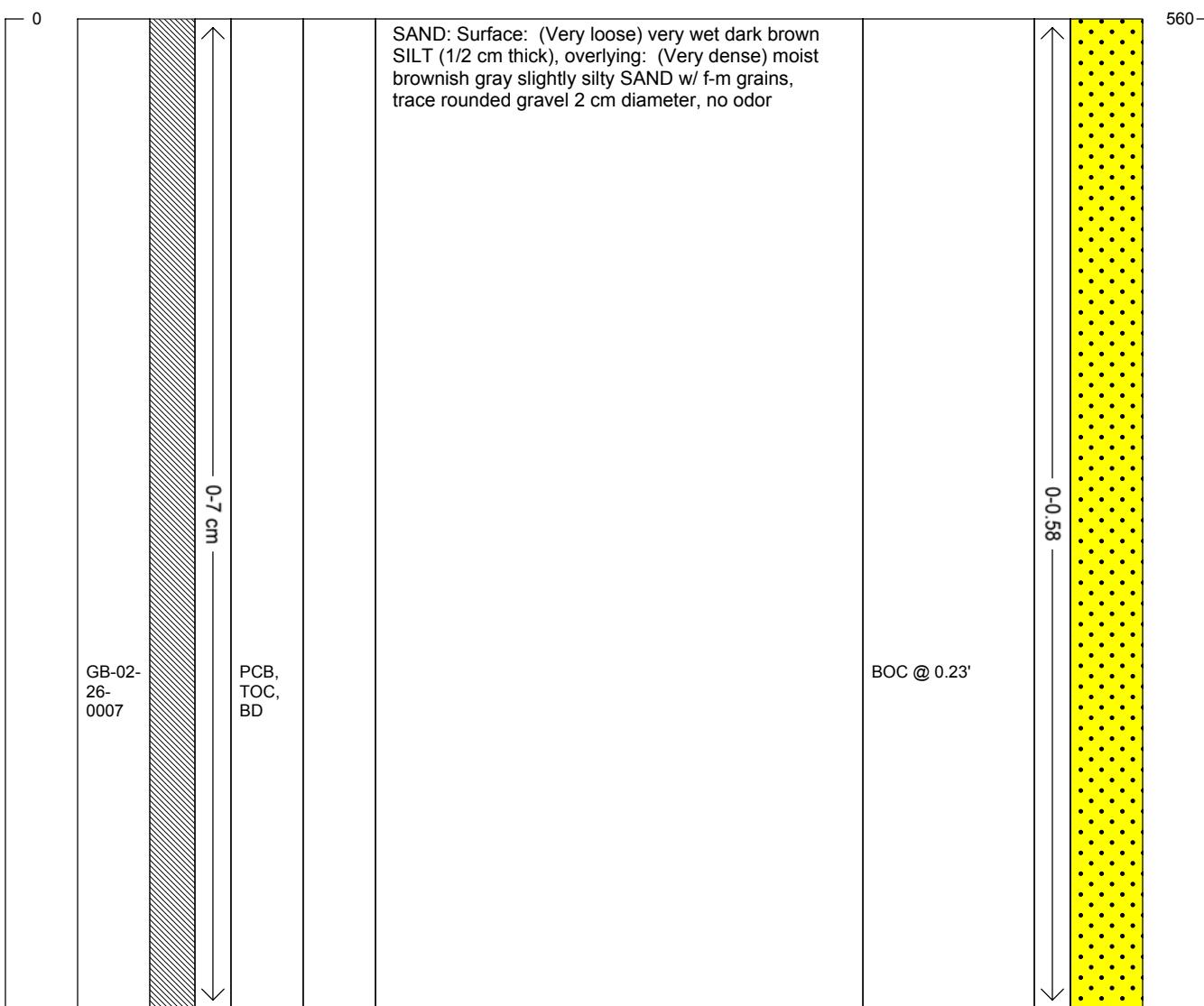


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-26

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.5 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>19</b>	Sample Quality: <b>poor</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>560 ft</b>	Recovery in ft (%): <b>0.2 (40)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>280976</b>	E./LONG: <b>2498097</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: TOC, PCB and bulk density from 0-7 cm

Calculated Recovery  
Sample Length/Penetration Length:

0.2 / 0.5 ft = 40 %



GB-02-26

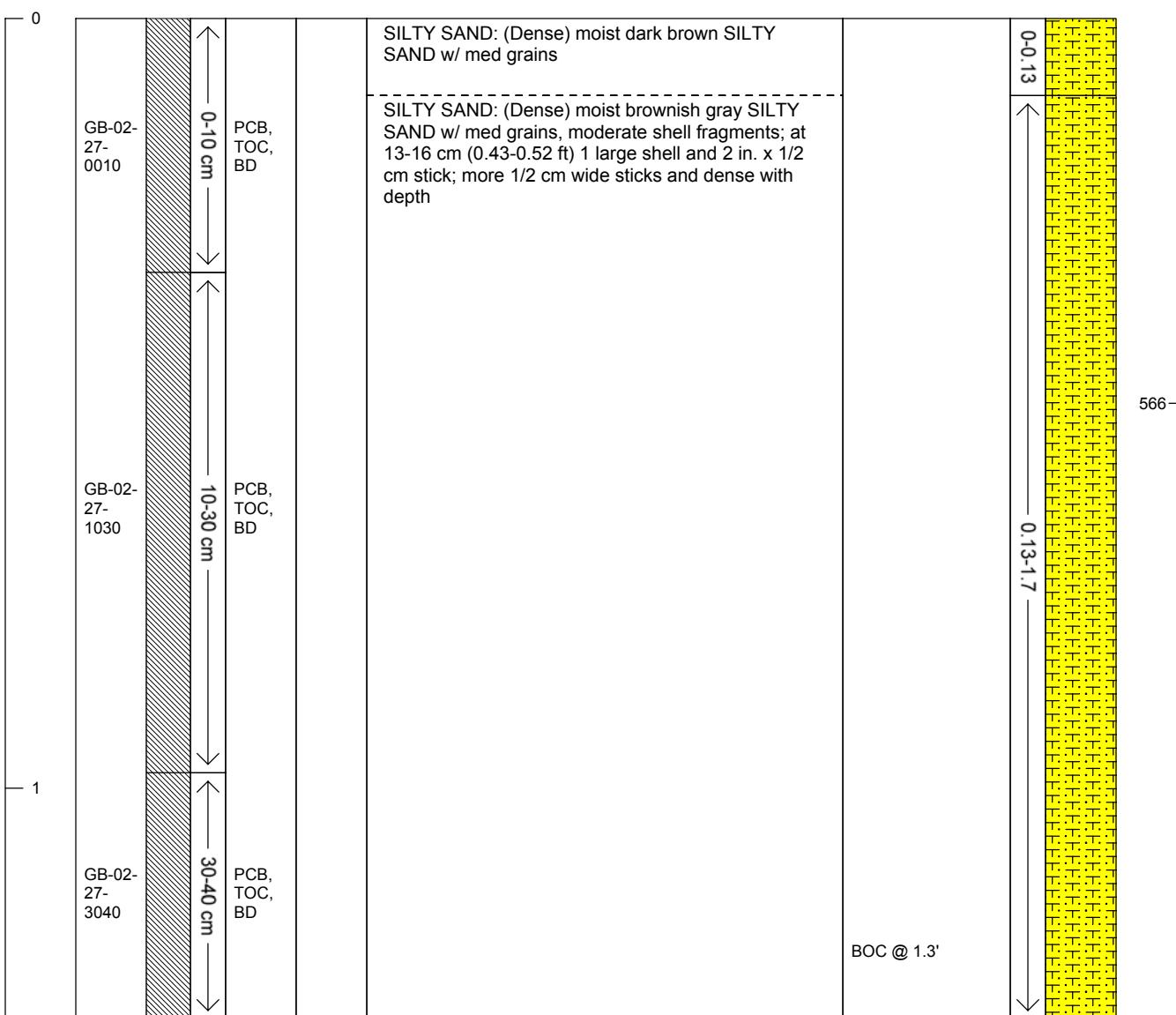


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-27

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.7 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>12.5</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>566.5 ft</b>	Recovery in ft (%): <b>1.3 (76)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>279676</b>	E./LONG: <b>2506564</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: 3 sample intervals

Calculated Recovery  
Sample Length/Penetration Length:  
**1.3 / 1.7 ft = 76 %**



**GB-02-27**

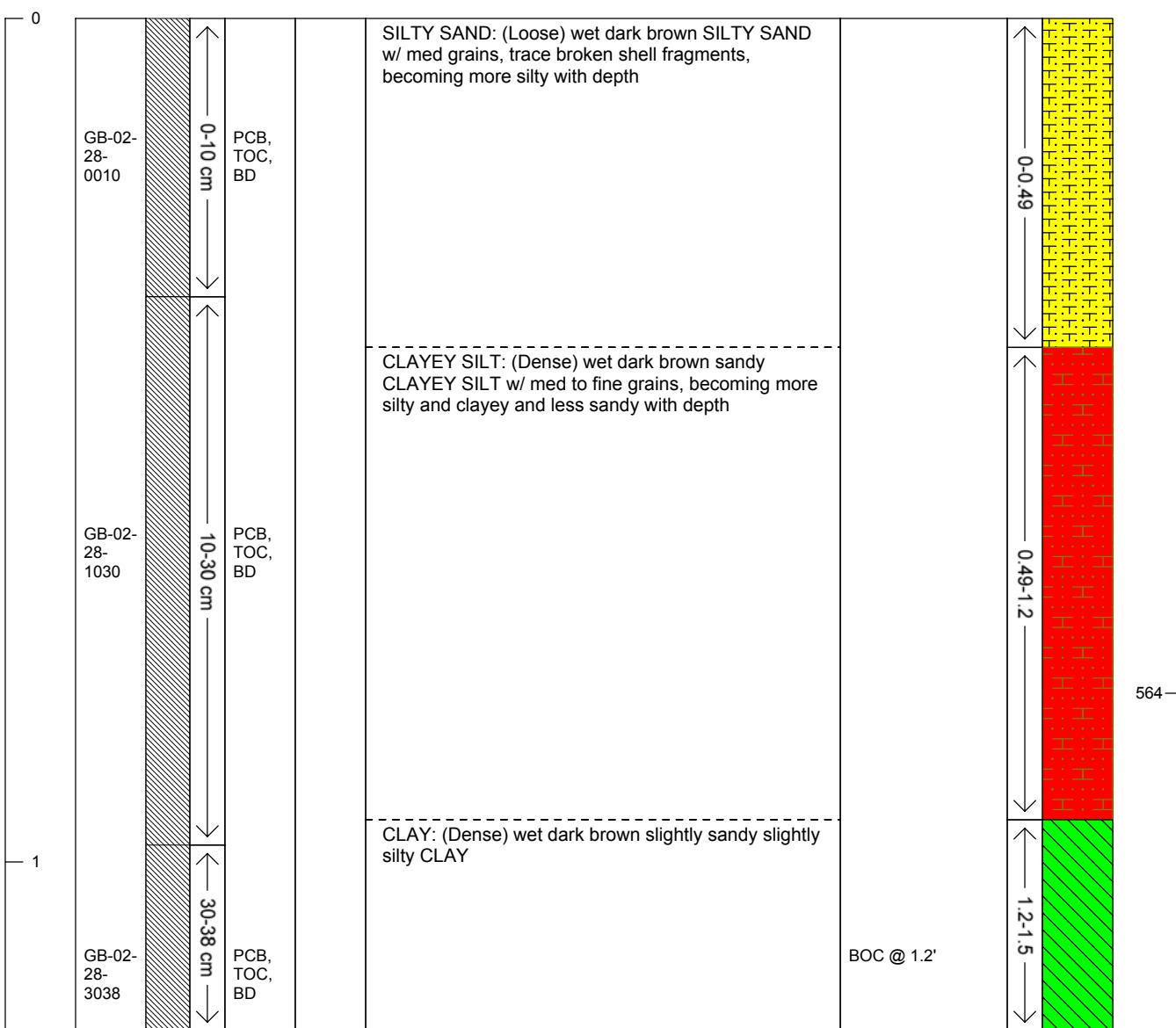


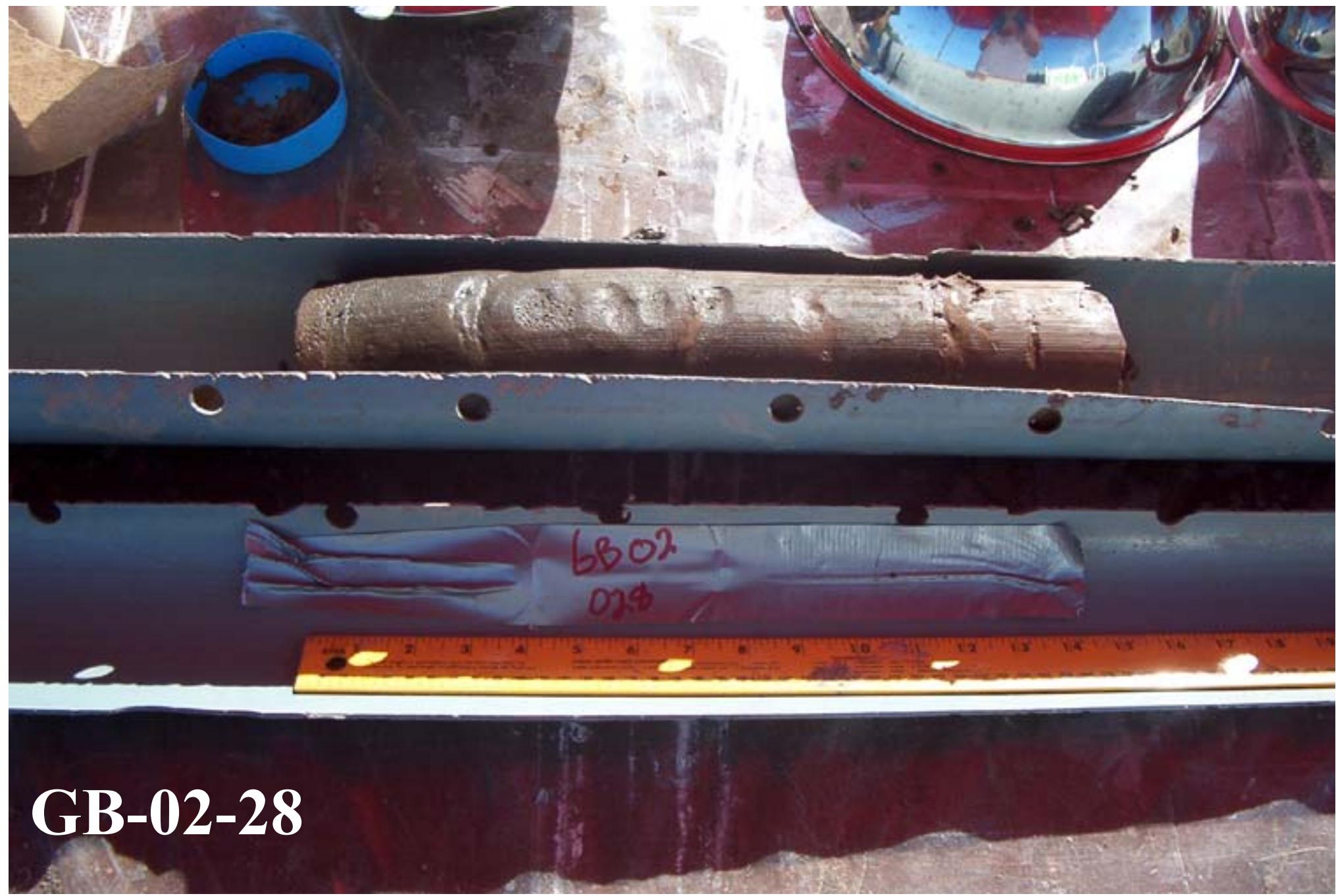
# Sediment Core Log

Core: GB-02-28

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.5 ft</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>14.2</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/24/2002</b>	Mudline Elevation (ft): <b>564.8 ft</b>	Recovery in ft (%): <b>1.2 (80)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>285679</b>	E./LONG: <b>2508654</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-28

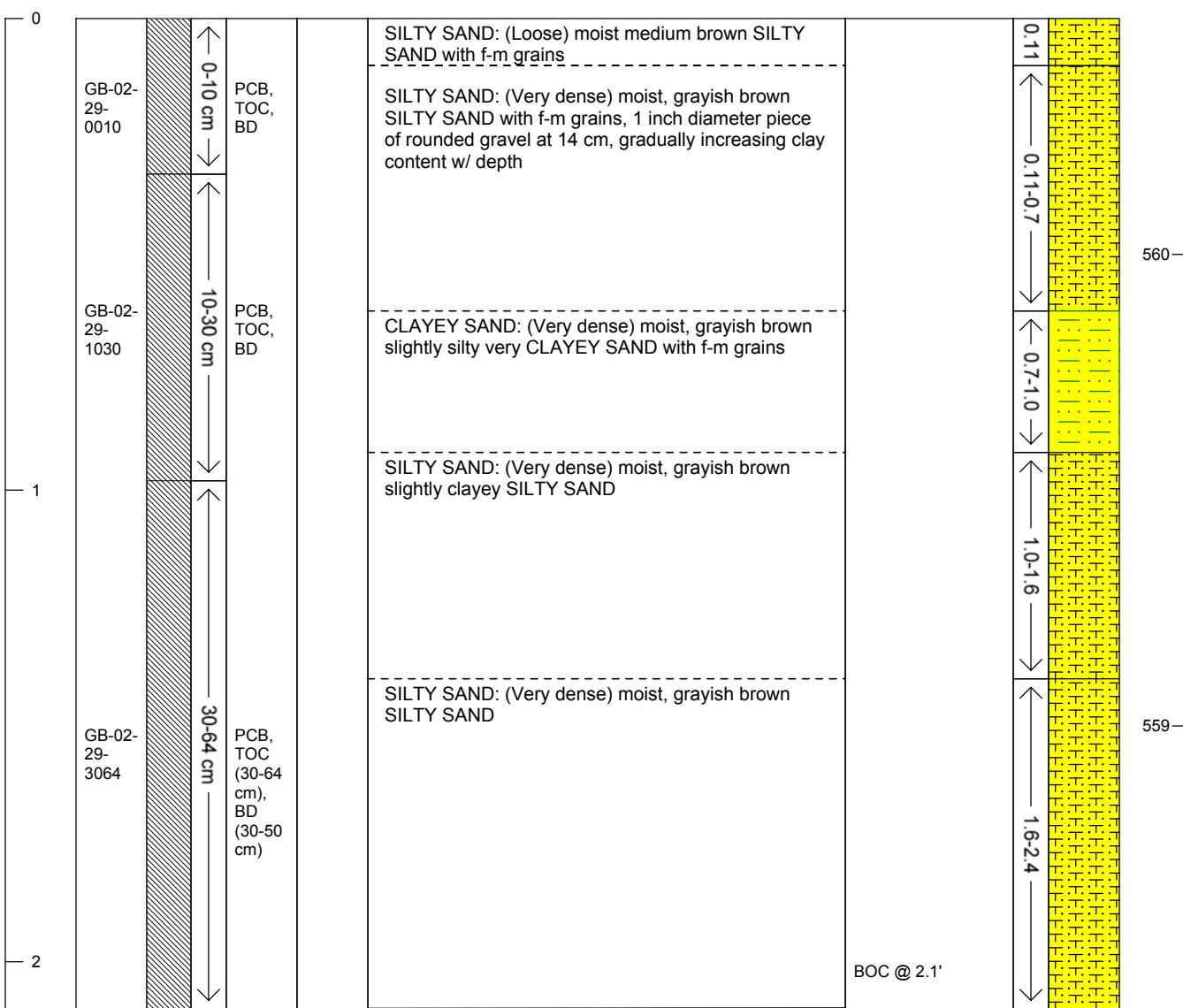


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-29

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.4 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>18.5</b>	Sample Quality: <b>fair</b>					
Collection Date: <b>7/25/2002</b>		Mudline Elevation (ft): <b>560.5 ft</b>	Recovery in ft (%): <b>2.1 (88)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>292327</b>	E./LONG: <b>2504360</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Bulk density from 0-10, 10-30, 30-50  
PCB, TOC from 0-10, 10-30, 30-64

Calculated Recovery  
Sample Length/Penetration Length:  
**2.1 / 2.4 = 88 %**



GB-02-29



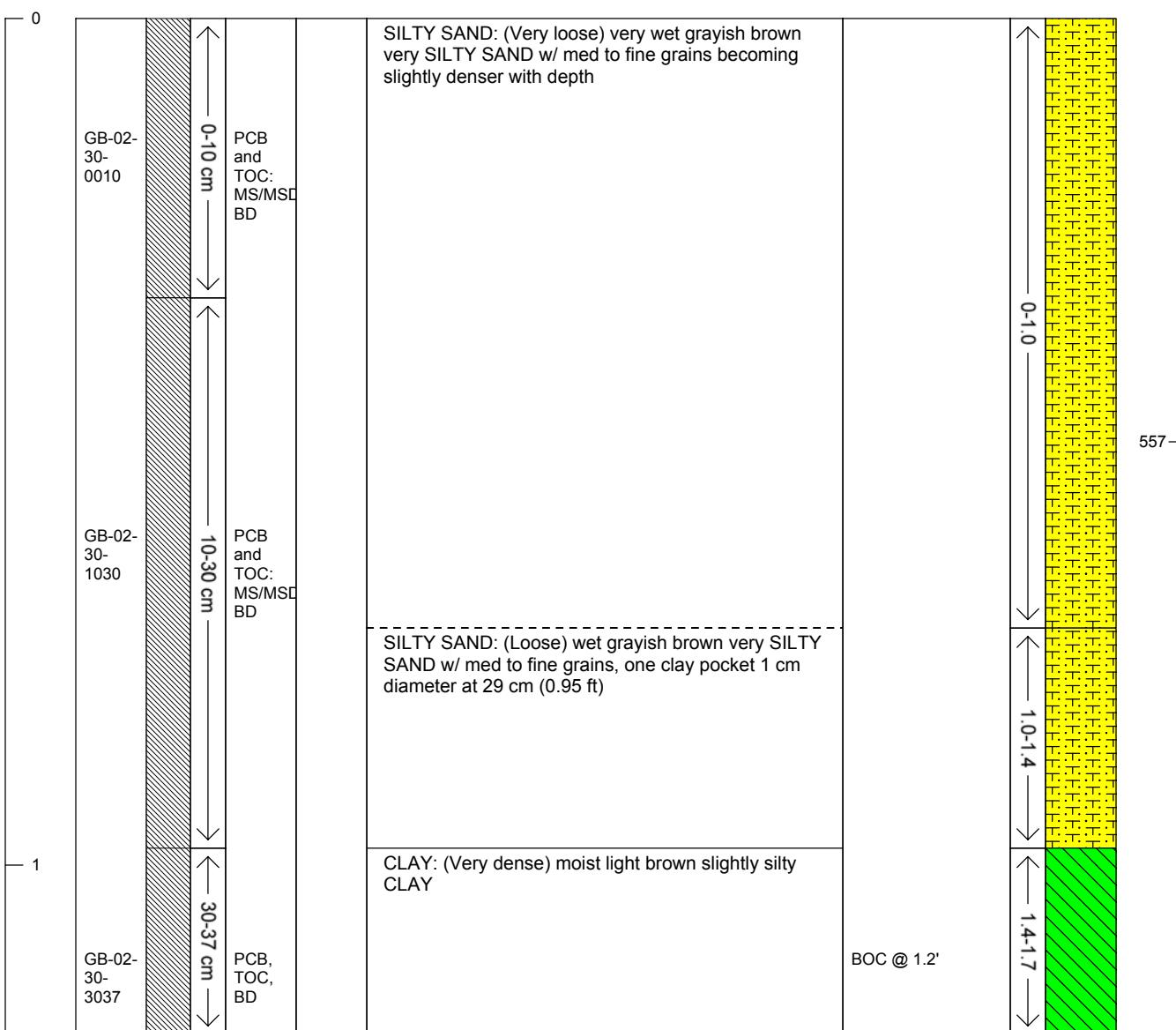
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-30

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.7 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>21.5</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/25/2002</b>	Mudline Elevation (ft): <b>557.5 ft</b>	Recovery in ft (%): <b>1.2 (71)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>299627</b>	E./LONG: <b>2515438</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Vert. Datum: <b>IGLD 85</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Process Method: <b>Extrude</b>
		Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)
-----------------------------	----------	---------------------------	----------	------------------	--	----------	---	---------------------------



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: MS/MSD collected for PCB, TOC from top two intervals

Calculated Recovery  
Sample Length/Penetration Length:  
 $1.2 / 1.7 \text{ ft} = 71\%$



GB-02-30

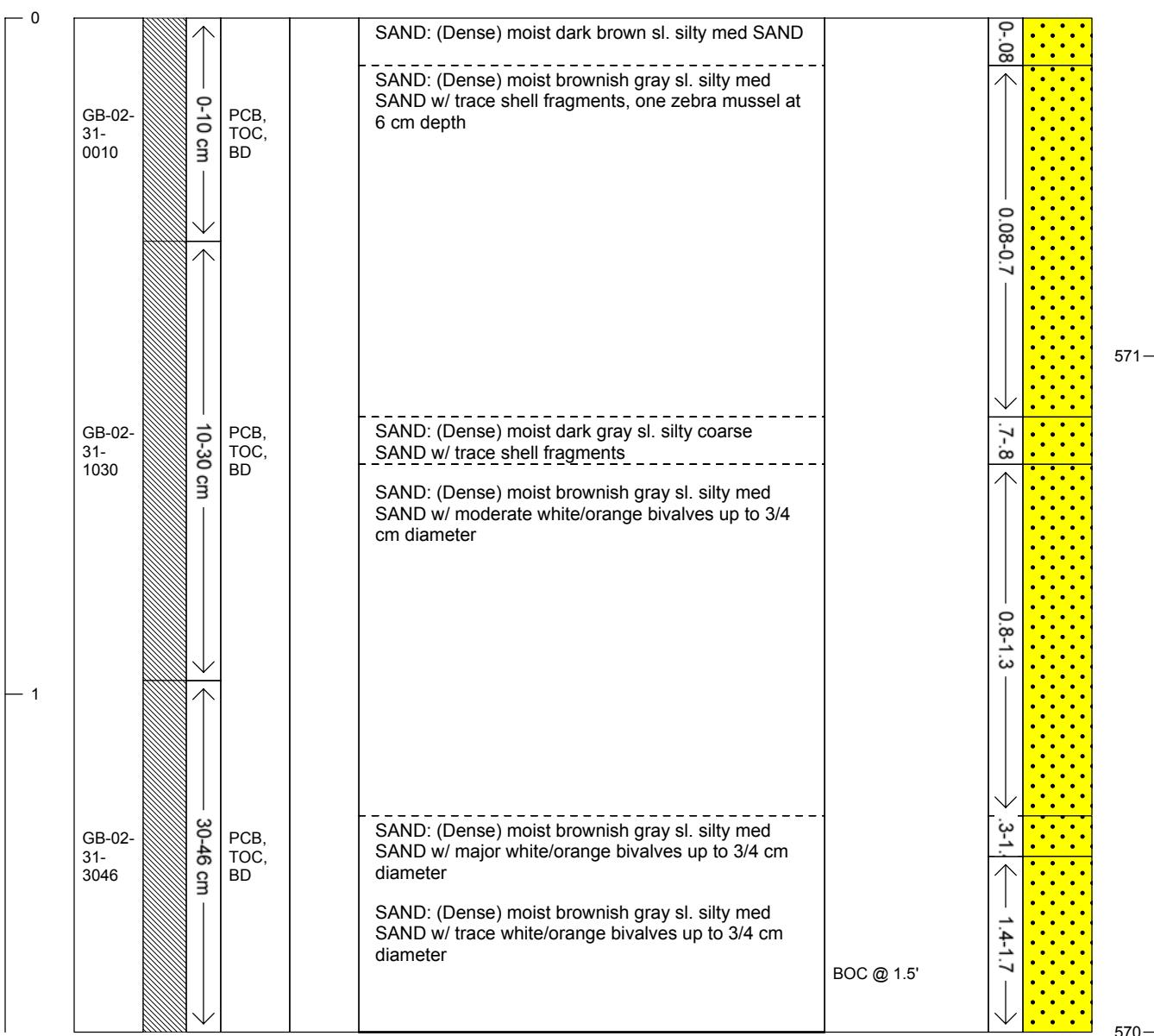


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-31

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.7 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>7.5</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>571.5 ft</b>	Recovery in ft (%): <b>1.5 (88)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>276668</b>	E./LONG: <b>2504213</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. Insitu Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: Split core longitudinally with circular saw

Calculated Recovery  
Sample Length/Penetration Length:

**1.5 / 1.7 ft = 88 %**



GB-02-31

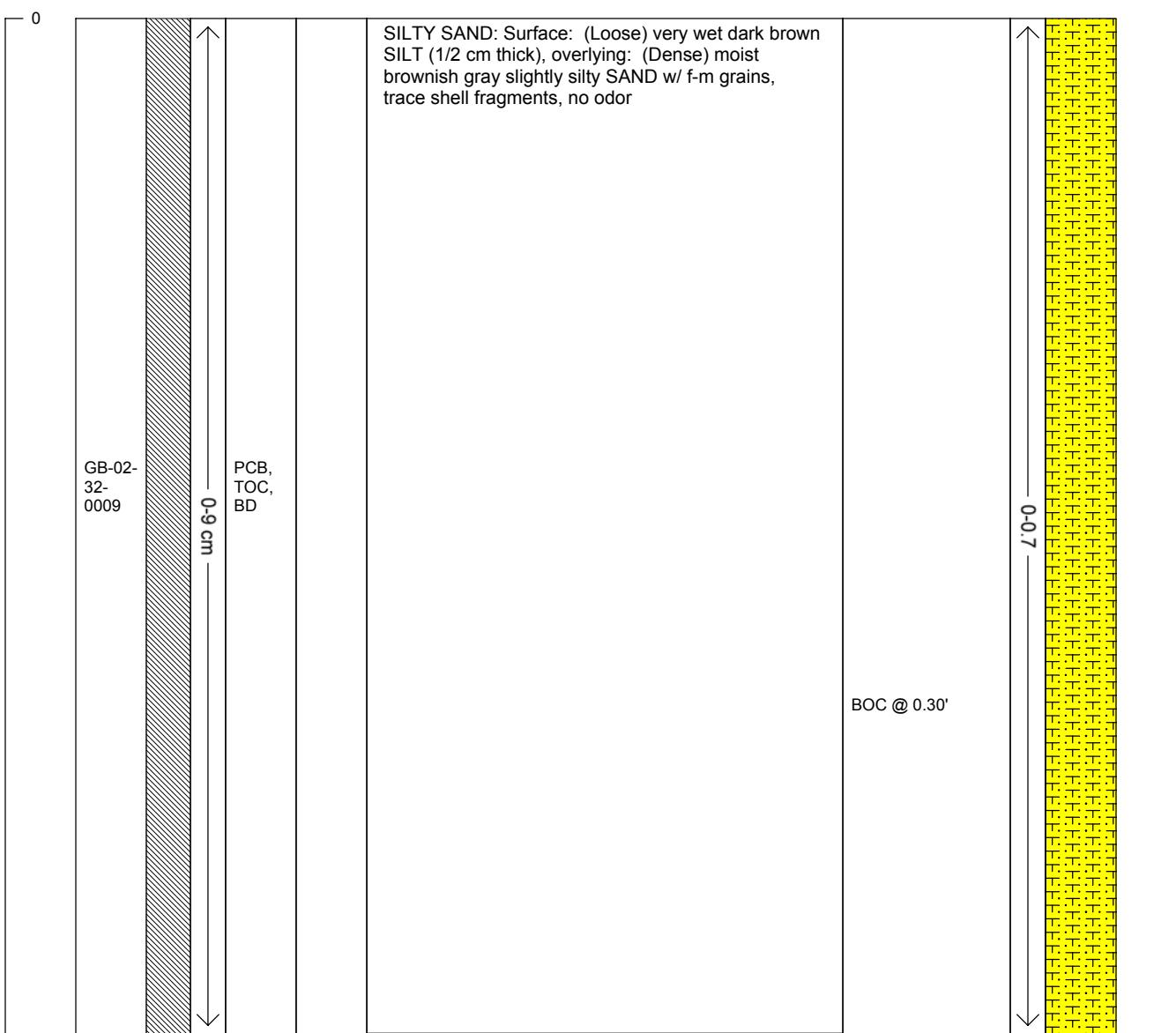


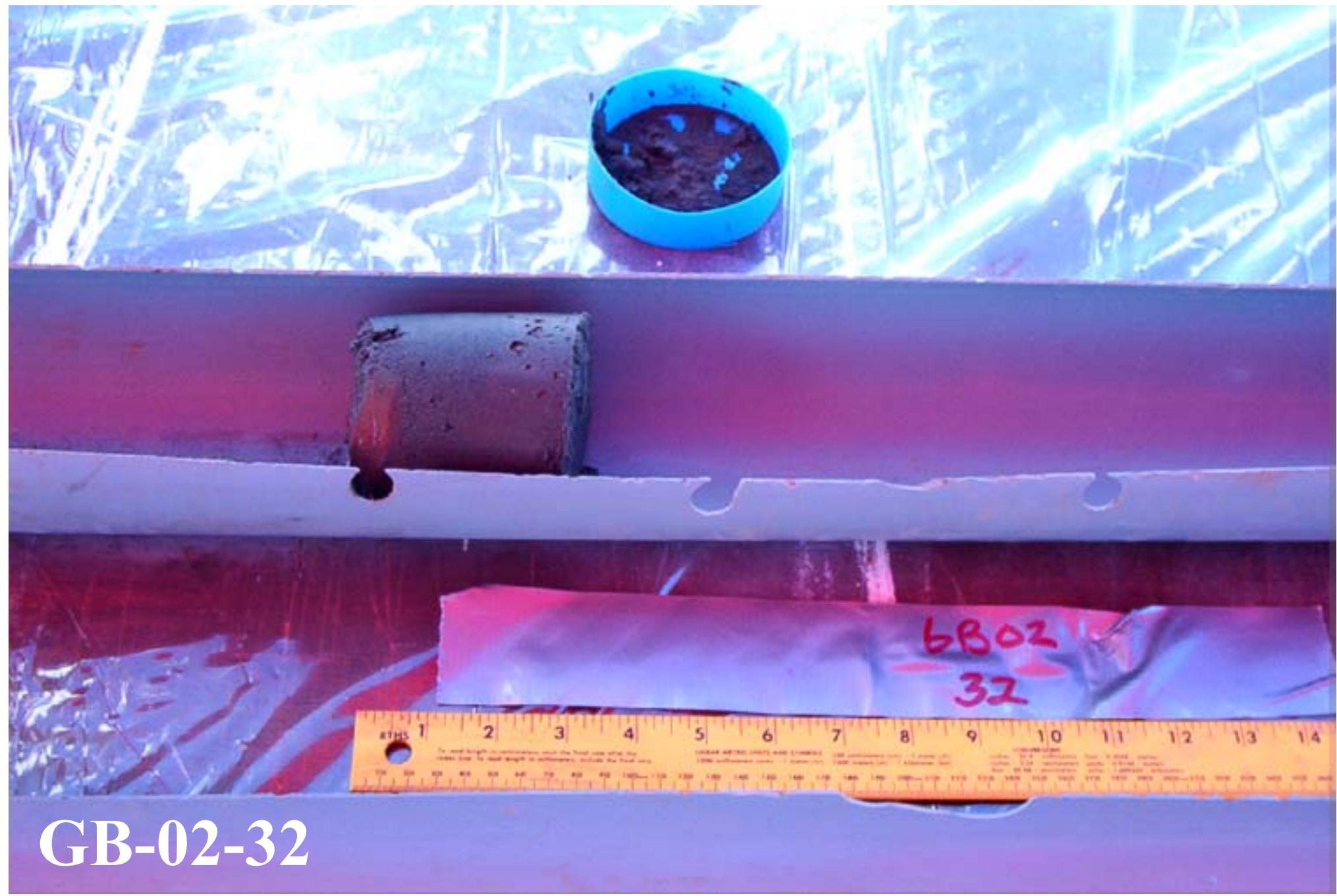
# Sediment Core Log

Core: GB-02-32

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>0.7 ft</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>16.1</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/24/2002</b>		Mudline Elevation (ft): <b>562.9 ft</b>	Recovery in ft (%): <b>0.3 (45)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>279937</b>	E./LONG: <b>2496250</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-32



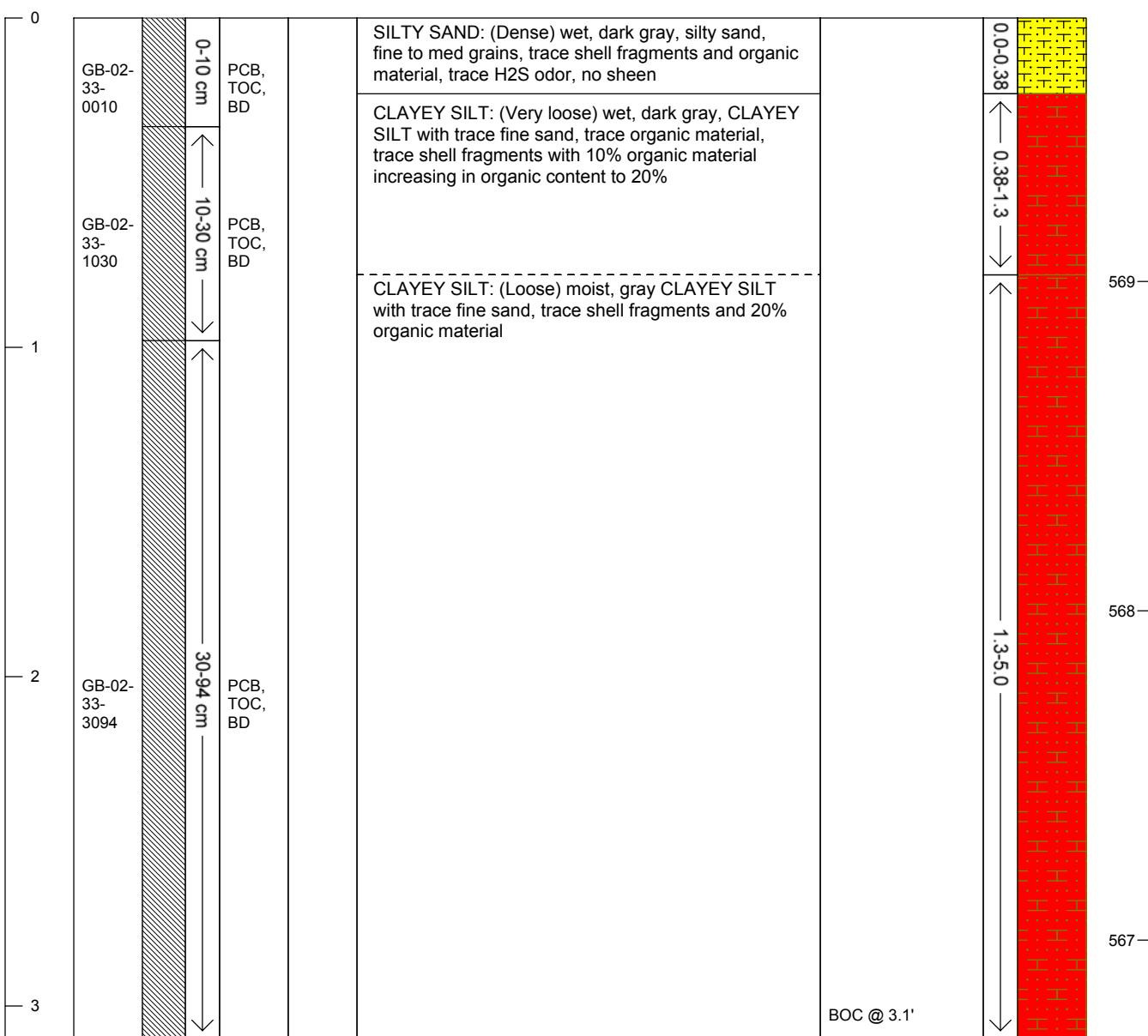
# Sediment Core Log

Sheet 1 of 1

Core: GB-02-33

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>5.0 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>9.2</b>	Sample Quality: <b>Good</b>
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>569.8 ft</b>	Recovery in ft (%): <b>3.1 (62)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>264101</b>	E./LONG: <b>2489249</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: PCB and TOC sampled from 30-94 cm increment

Bulk density sampled from 50-70 cm increment

Calculated Recovery  
Sample Length/Penetration Length:  
 $3.1 / 5 = 62 \%$



GB-02-33

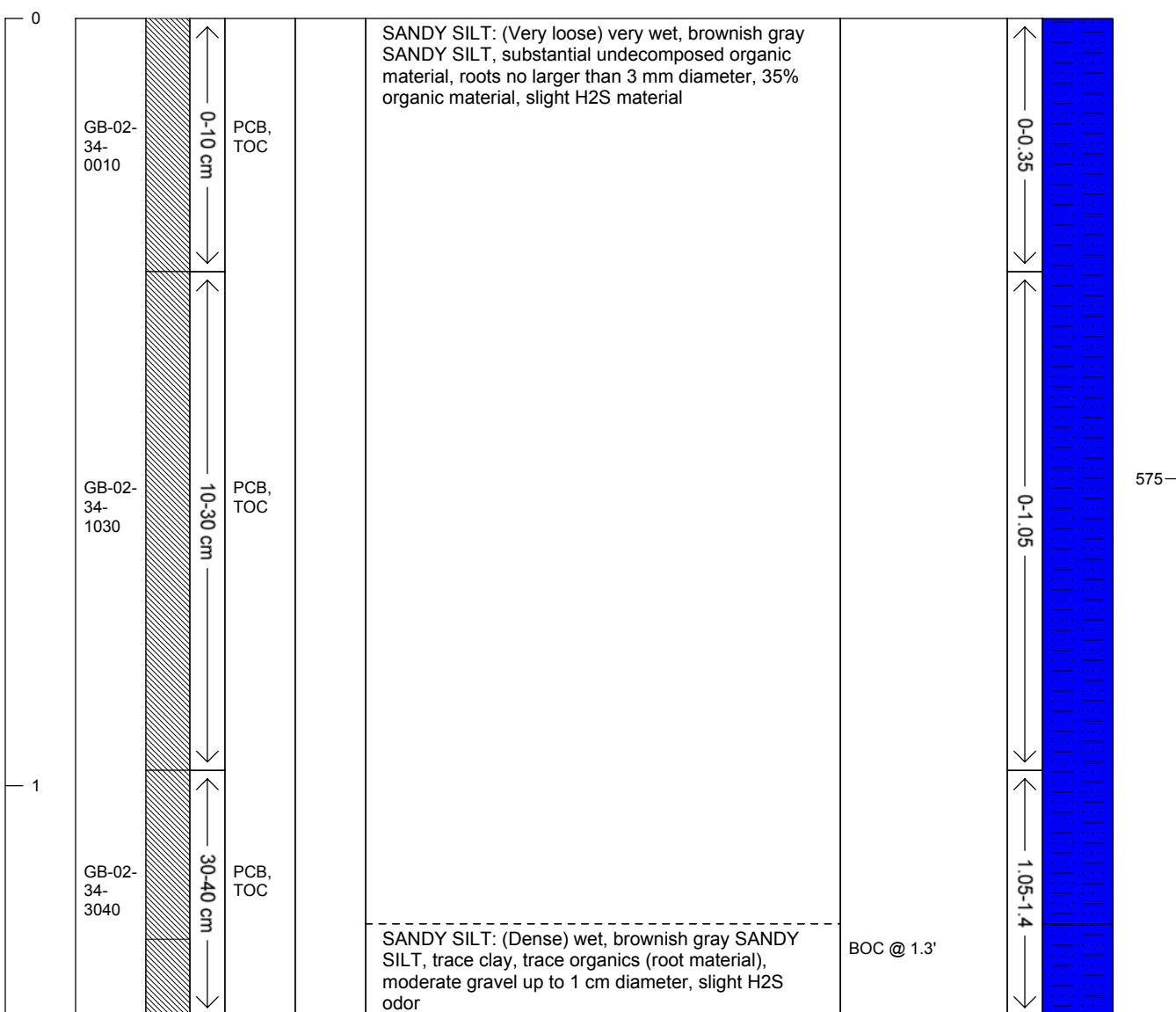


# Sediment Core Log

Sheet 1 of 1

Core: GB-02-34

Project: <b>Green Bay Supp. Sed. Samp.</b>		Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>					
Project #: <b>WISCN-16040-100</b>		SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.3</b>					
Client: <b>WDNR</b>		Water Depth (ft): <b>3.4</b>	Sample Quality: <b>good</b>					
Collection Date: <b>7/22/2002</b>		Mudline Elevation (ft): <b>575.6 ft</b>	Recovery in ft (%): <b>1.3 (93)</b>					
Contractor: <b>RETEC</b>		N./LAT: <b>267420</b> E./LONG: <b>2486885</b>	Process Date: <b>7/22/2002</b>					
Vessel: <b>25' sampling boat</b>		Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>					
Operator: <b>Superior Services</b>		Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>					
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: **PCB, TOC, BD per increment**

Inner diameter = **8.1 cm**

Calculated Recovery  
Sample Length/Penetration Length:

**1.3 / 1.4 ft = 93 %**



GB-02-34

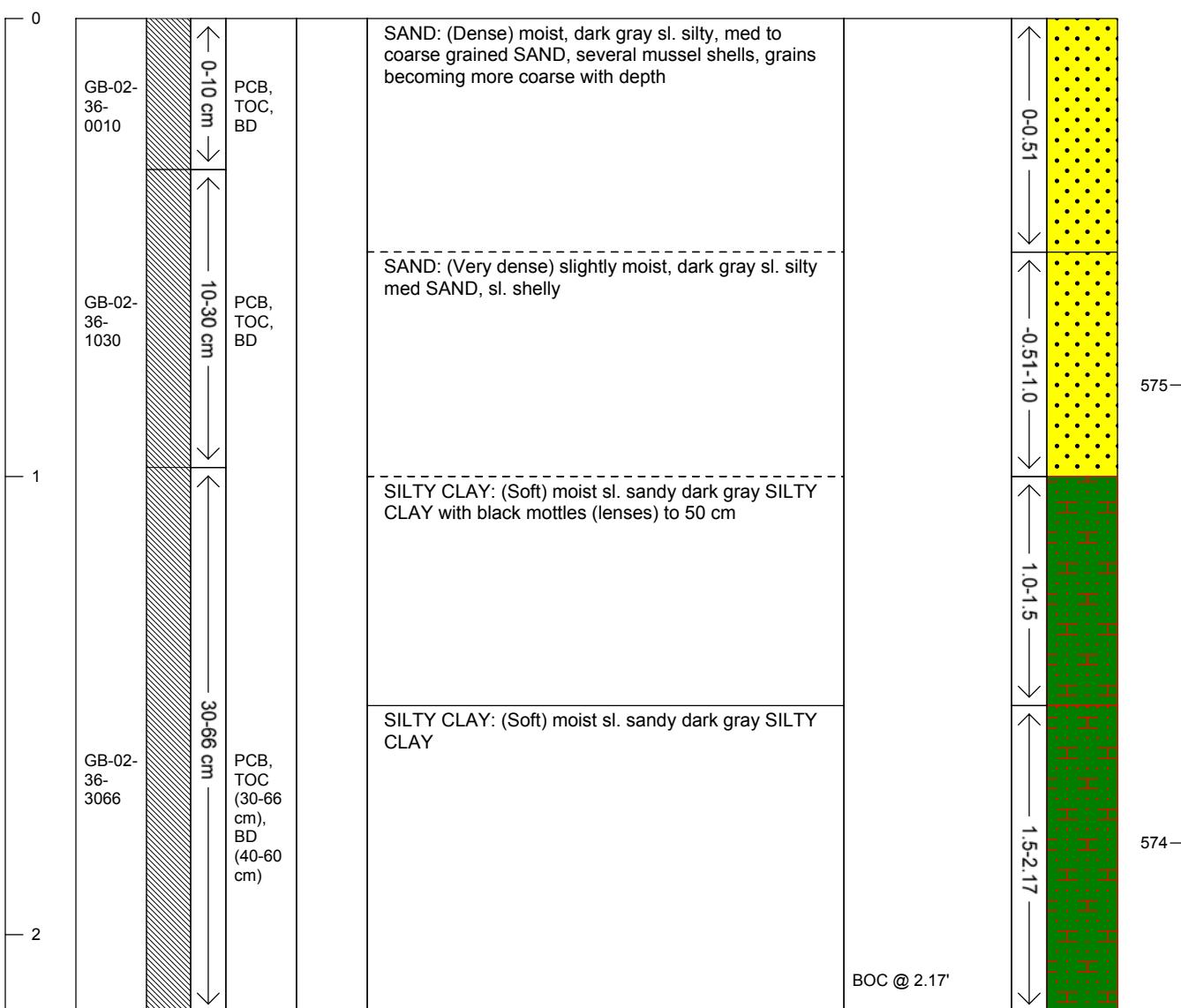


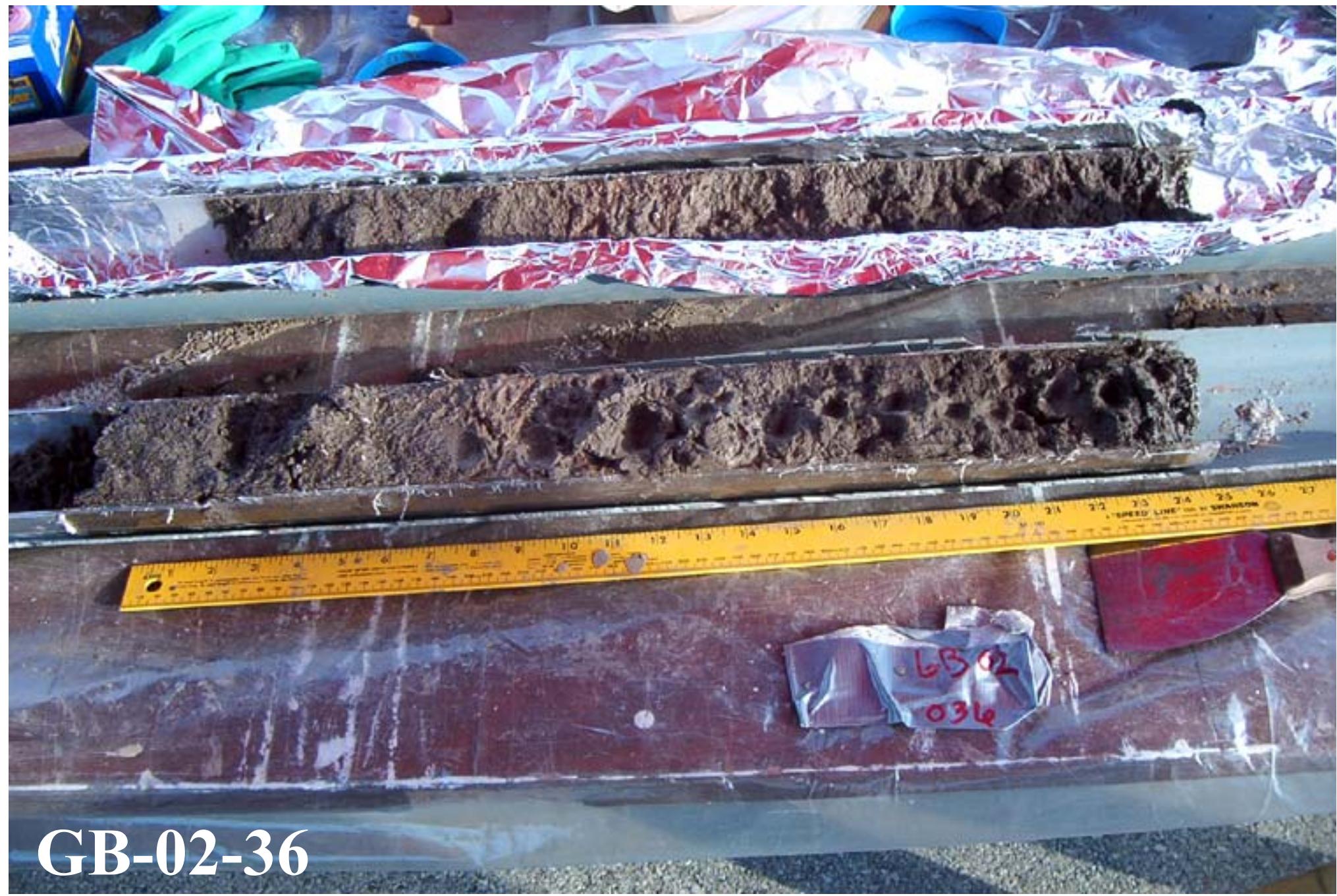
# Sediment Core Log

Core: GB-02-36

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>						
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>2.17</b>						
Client: <b>WDNR</b>	Water Depth (ft): <b>3.2</b>	Sample Quality: <b>good</b>						
Collection Date: <b>7/22/2002</b>	Mudline Elevation (ft): <b>575.8 ft</b>	Recovery in ft (%): <b>2.17 (100)</b>						
Contractor: <b>RETEC</b>	N./LAT: <b>265422</b>	E./LONG: <b>2491688</b>						
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b>	Process Method: <b>Extrude</b>						
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>						
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace PID	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)





GB-02-36



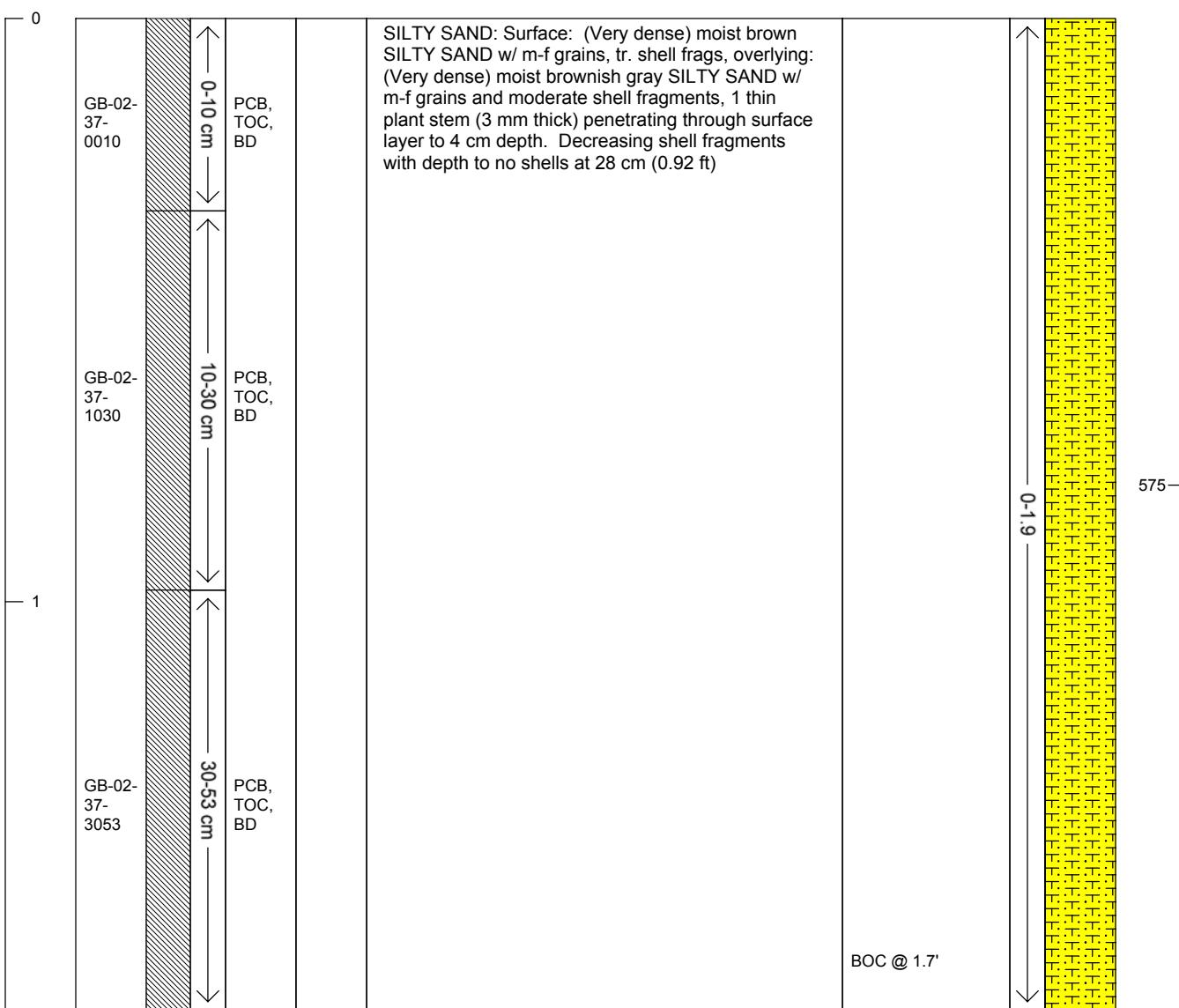
# Sediment Core Log

Core: GB-02-37

Sheet 1 of 1

Project: <b>Green Bay Supp. Sed. Samp.</b>	Water Body Type: <b>Lacustrine</b>	Tube Length: <b>6.0 ft</b>
Project #: <b>WISCN-16040-100</b>	SW Elevation (ft)/Tide: <b>579 ft</b>	Penetration Depth: <b>1.9 ft</b>
Client: <b>WDNR</b>	Water Depth (ft): <b>3.2</b>	Sample Quality: <b>good</b>
Collection Date: <b>7/23/2002</b>	Mudline Elevation (ft): <b>575.8 ft</b>	Recovery in ft (%): <b>1.7 (89)</b>
Contractor: <b>RETEC</b>	N./LAT: <b>269516</b> E./LONG: <b>2491573</b>	Process Date: <b>7/23/2002</b>
Vessel: <b>25' sampling boat</b>	Horiz. Datum: <b>NAD 83</b> Vert. Datum: <b>IGLD 85</b>	Process Method: <b>Extrude</b>
Operator: <b>Superior Services</b>	Method/Tube ID: <b>Diver assited 3 in. push core</b>	Logged By: <b>Dan Berlin</b>

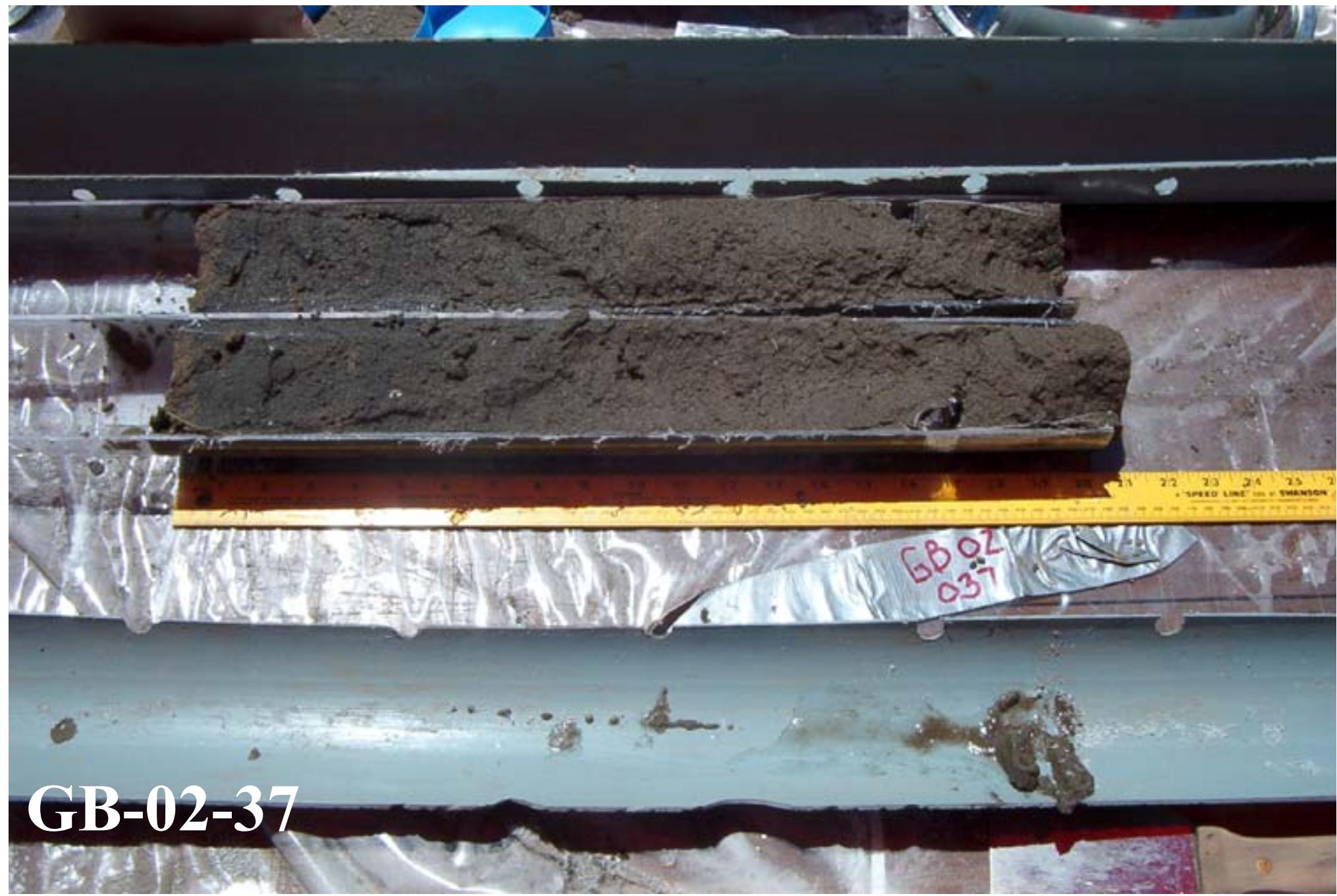
Depth (ft) Below Mudline	Sample #	Sample & Interval (ft)	Analysis	Headspace P/D	Sediment Description Classification Scheme: ASTM (Actual recovered depth interval in feet)	Comments	Calc. In situ Depths (ft) & Graphic Log	Mudline Elevation (ft)



The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134-1162  
Phone: (206) 624-9349  
Fax: (206) 624-2839

Remarks: TOC, PCB and bulk density from each increment

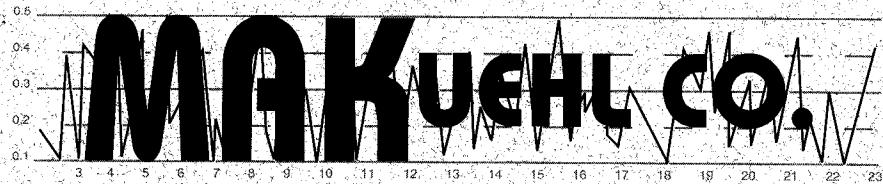
Calculated Recovery  
Sample Length/Penetration Length:  
 $1.7 / 1.9 \text{ ft} = 89\%$



GB-02-37

**APPENDIX C**

**DATA VALIDATION REPORT**



Data Validation

Lab/Field Audits

QA Plans

## TECHNICAL MEMORANDUM

**DATE:** October 10, 2002

**TO:** Greg Hill, Project Manager  
Wisconsin Department of Natural Resources

**FROM:** Marcia A. Kuehl  
President/Owner  
MAKuehl Company

**SUBJECT:** Data Validation for Green Bay Sediments  
July 9, 22-25, 2002 Sampling Events  
Project # 15933-100

### 1.0 OVERVIEW

Analytical results for the sediment samples collected from Green Bay and their associated laboratory QC samples on July 9 and between July 22-25, 2002 have been evaluated using the EPA guidance documents "National Functional Guidelines for Organic Data Review", dated October, 1999, EPA-540/R-99/008 (NFGO), and the EPA Region V "Standard Operating Procedure for Validation of CLP Organic Data, April, 1991, Last Revised February, 1997" (Region V SOP).

The specific calibration and laboratory QC check requirements contained in the "Quality Assurance Project Plan for Supplemental Data Collection Fox River RI/FS dated June 18, 1998" (QAPjP) and the "Addendum to Quality Assurance Project Plan for Supplemental Data Collection Fox River RI/FS for Green Bay Sediment Analyses, Revision 1, dated September 2, 2002" (Addendum) were the primary criteria used in the assessment of the data for compliance with the project data quality objectives. The review was based on the laboratory data packages as defined in Table 9-1 of the QAPjP and Section 9 of the Addendum supplied by the analytical laboratory, EnChem, located in Madison, Wisconsin.

**All Aroclor data as reported by EnChem was usable and valid. Both Aroclor and TOC values above the LOD but less than the LOQ were qualified as estimated. In addition, TOC values were qualified as estimated from imprecision between the four replicates. The TOC in sample GB02-12-0010 was qualified as estimated from low matrix spike recovery. All qualifiers assigned during the data validation process are discussed in detail below. The validated data sheets are attached.**

## **2.0 PCB AS AROCLORS DATA**

EnChem utilized their SOP SVO-FOX, Revision No. 1, dated July 19, 2002 for extraction and analysis and SOPs 3-SVO-27 and 3-SVO-28, Revision No. 1, dated September 1996 for sulfur removal and extract clean up by sulfuric acid. These SOPs are based on EPA SW846 reference methods 3550B, 3660A and 8082. No significant deviations from these EPA SW846 reference methods or WDNR requested modifications (i.e. air drying of sediment prior to extraction) was apparent from the documentation reviewed. No action was needed to qualify sample data.

### **2.1 Completeness Assessment**

The data packages received for PCB analyses were complete. All samples submitted were extracted and analyzed.

### **2.2 Compliance Assessment**

#### **2.2.1 Holding Times/Preservation**

All samples were extracted within the holding times in QAPjP Table 5-4 (14 days for refrigerated sediment and 6 months for frozen sediment) and analyzed within 40 days after extraction. No notation of shipping temperature in exceedance of  $4 \pm 2^{\circ}\text{C}$  was noted. No action was needed to qualify PCB sample data based on holding time or preservation exceedances.

#### **2.2.2 Initial Calibration (ICAL)**

Five multipoint initial calibration curves ranging from 0.1-1.0 ug/ml for Aroclor 1242 and 1254 were analyzed on both columns, RTX-CLP and RTX-CLP2, on 8/6/02, 8/8/02, 8/16/02, 8/19/02, 8/26/02, and 8/27/02. The mean Relative Standard Deviation (RSD) values for the 10 representative Aroclor peaks selected were less than the 20 % criteria contained in QAPjP Section 8. All other Aroclors (1016, 1221, 1232, 1248, 1260) were analyzed at least once daily to verify pattern and retention times. No action was needed to qualify sample data based on inadequate calibration.

#### **2.2.3 Calibration Verification (CCAL)**

The CCAL consisted of a 0.5 ug/ml solution of Aroclor 1242 or Aroclor 1254. Frequency was every 10 samples and at the end of the instrument run. The mean percent differences between the CCAL and ICAL calibration factors for the 10 representative Aroclor peaks were all less than the 15 % criteria contained in Section 8 of the QAPjP. No action was needed to qualify sample data based on calibration instability.

#### **2.2.4 Laboratory Blanks**

At least one laboratory blank was prepared and extracted with every 20 project samples analyzed. No Aroclors above the LOD of 11 ug/kg (SDG 922546A) or 22 ug/kg were present in any laboratory blank. No action was needed to qualify sample data based on detected blank concentrations.

## 2.2.5 Surrogate Recoveries

All method blanks were within the EnChem surrogate recovery limits of 60 - 140 %. For samples with dilution factors of less than ten, all recoveries of decachlorobiphenyl (DCB) and tetrachloro-m-xylene (TCX) were within 60 - 140 % except for DCB on the confirmation column (RTX-CLP2) for GB02-36-3066 (60 %), DCB on both columns for GB02-05-3069 (48 %, 50 %) and DCB on the quantitation column (RTX-CLP) for GB02-37-3053 (56 %). None of these samples were re-extracted, as the EnChem SOP requires re-extraction only when both DCB and TCX are outside the limits. No action was taken to qualify sample data based on the low DCB recoveries.

## 2.2.6 Matrix Spike/Matrix Spike Duplicate

Project samples used for MS/MSD analyses in accordance with the QAPjP and prepared and analyzed with every SDG or batch of 20 samples. The project samples used were GB02-01B-1030, GB02-12-0010, GB02-30-1030, GB02-12-1035, GB02-01B-0010, GB02-30-0010 and GB02-01B-3043. All samples were spiked with 1,000 ug/kg Aroclor 1242 and all recoveries were within the EnChem limits of 65 - 135 %. No action was taken to qualify sample data based on MS/MSD recovery.

## 2.2.7 Laboratory Control Sample (LCS)

At least one Laboratory Control Sample (LCS) was prepared and analyzed with each SDG or 20 samples. The solid LCS consisted of 20 grams of a 0 % moisture sample containing 250 ppb Aroclor 1242. All recoveries measured were within the 70-130 % advisory limits contained in method 8082 and the EnChem limits of 65 - 135 %. No action was needed to qualify sample data based on LCS recovery.

## 2.2.8 Detection Limit Attainment

The Project Action Limit of 125 ug/kg defined in the Addendum was attained in every undiluted sample, as the EnChem Limit of Quantitation (LOQ) reported was 70 ug/kg and the EnChem Limit of Detection (LOD) reported was 22 ug/kg. Dilutions were required to keep the sample response within the linear range of the instrument for the following samples:

GB02-34-1030 (6 X)  
GB02-33-0010 (5 X)  
GB02-33-1030 (100 X)  
GB02-33-3094 (50 X)  
R1-02-B (3 X)  
R1-02-A (3 X)

The LOD and LOQ for these samples were multiplied appropriately by the dilution factor.

The group of samples in SDG 922546A were taken to a final volume of 5.0 ml, rather than the 10 ml listed in the SOP. Accordingly, the LOD and LOQ were lower by a factor of 2.

Several PCB values were reported with a "Q" qualifier by EnChem. The "Q" indicates those values above the LOD, but below the LOQ. A "J" code was added to the "Q" qualified results to indicate to the data user that the result reported should be considered an estimate, as it lies within the imprecise region for quantitation above the LOD but less than the LOQ.

#### **2.2.9 Verification of Reported Results**

Reported sample concentrations and QC sample results were recalculated to check for accuracy. No discrepancies that were not due to differences in lab instrument software and the validator's calculator significant figure/rounding protocols were found. No reporting errors or discrepancies between the raw and hard copy were discovered during validation. All values reported for sample results are from the primary column, RTX-CLP and the quantitation was confirmed on the second column, RTX-CLP2 to within 25 % of the reported result. The analysis on the second column was also reviewed to assess if the Aroclor pattern(s) were confirmed. All Aroclor 1242, 1254 and 1260 patterns reported as detected were confirmed.

The QAPjP retention time window criteria of  $\pm 0.03$  minutes for the 5-10 peak match for Aroclor 1242, the 3-5 peak match for Aroclor 1254 and the 10 peak match for Aroclor 1260 identification was met in all samples. No action was needed to qualify sample data.

#### **2.3 Field QC Results**

No field duplicates or field blanks were collected. However, collocated samples were collected and labeled as GB02-01A-0010 and GB02-01B-0010. PCB results for these two samples were 110 and 98 ug/kg Aroclor 1242 (11 % RPD). No action was taken to qualify sample data based on the collocated field sample precision.

#### **2.4 Data Usability**

All Aroclor data as reported by EnChem was usable and valid as reported without qualification, except for values between the LOD and LOQ qualified as estimated (J).

### **3.0 TOC**

Sediment samples were analyzed in quadruplicate by EnChem SOP WCM-18, Revision No. 5, dated April 1999, which is based on the EPA SW846 reference method 9060. No significant deviations from the EPA SW846 reference method or EnChem SOP was apparent from the documentation reviewed. No action was needed to qualify sample data.

#### **3.1 Completeness Assessment**

The data package received for TOC analysis were complete. No action was needed to qualify sample data.

### **3.2 Compliance Assessment**

#### **3.2.1 Holding Times/Preservation**

All samples were analyzed within the holding times in QAPjP Table 5-4 (28 days for refrigerated sediment and 6 months for frozen sediment). No notation of shipping temperature in exceedance of  $4 \pm 2^{\circ}\text{C}$  was noted. No action was needed to qualify TOC sample data based on holding time or preservation exceedances.

#### **3.2.2 Initial Calibration**

An initial calibration consisting of a single point was analyzed each day samples were analyzed in accordance with the method and QAPjP Section 8. An additional three standards ranging from 1000-3500 mg/kg were then analyzed to define the linear range and all recoveries were within the method and QAPjP limits of 90 - 110 %. All Initial calibration verification (ICV) standards were also within the method and QAPjP limits of 90 - 110 %. No action was needed to qualify sample data based on calibration results.

#### **3.2.3 Calibration Verification**

Continuing Calibration Verification (CCV) standards (2000 mg/kg) were analyzed after every ten samples in accordance with the method and QAPjP Section 8 and all recoveries were within the QAPjP 90 - 110 % recovery limits. No action was needed to qualify sample data based on continuing calibration results.

#### **3.2.4 Laboratory Blanks**

An Initial Calibration Blank (ICB) was analyzed each day samples were analyzed. Continuing Calibration Blanks (CCB) were analyzed after every ten samples injected into the TOC analyzer. No laboratory blanks contained TOC above the Limit of Quantitation (LOQ) of 760 mg/kg. One laboratory blank in SDG 922531B contained TOC above the Limit of Detection (LOD) at 373 mg/kg. No action was needed to qualify sample data, as all samples analyzed with this blank exceeded the blank concentration by more than a factor of 10,

#### **3.2.7 Sample Replicates/Duplicates**

All samples were analyzed in quadruplicate. Relative Standard Deviation (RSD) values calculated were within the RPD criteria of 20 % in QAPjP Table 4-1 for duplicate precision except for the samples listed in Table 2.

No specific criteria for sample quadrupletes were contained in the QAPjP or Addendum. However, this validator qualified the TOC average for these samples with a J code indicating estimated data from one of the four replicates varying from the other three. The sample matrix may therefore not be homogeneous.

### 3.2.8 Matrix Spike/Matrix Spike Duplicates

Recoveries were all within the Addendum limits of 75 - 125 % except for GB02-12-0010. Recoveries measured were 37.5 % and 40 %. Action taken was to qualify the TOC results for GB02-12-0010 with a J code indicating estimated data, possibly biased low from a matrix effect.

### 3.2.9 Lab Control Standard (LCS)

An LCS sample at a concentration of 950 mg/kg was digested and analyzed with every 20 samples. All recoveries were within the QAPjP Table 4-1 accuracy limits of 70 - 130 % and the lab limits of 80 - 127 %. No action was needed to qualify sample data.

### 3.2.10 Detection Limit Attainment

The LOQ of 760 mg/kg and the LOD of 240 mg/kg was attained in all project samples when adjusted for percent solids and dilutions needed to keep the TOC sample concentration within the calibration range. Samples that required dilution either due to color and consistency or to keep the TOC values within the linear range of the TOC analyzer were:

GB02-01B-3043 (10 X )  
GB02-01B-1030 (2 X )  
GB02-34-0010 (10 X )  
GB02-11-1030 (10 X )  
GB02-33-3094 (1 X )  
GB02-04-3084 (2 X )

Several TOC values were reported with a "Q" qualifier by EnChem. The "Q" indicates those values above the LOD, but below the LOQ. A "J" code was added to the "Q" qualified results to indicate to the data user that the result reported should be considered an estimate, as it lies within the imprecise region for quantitation above the LOD but less than the LOQ.

### 3.2.11 Verification of Reported Results

Reported sample and QC sample concentrations and calculated QC results (RPD and recovery values) were recalculated to check for accuracy. No discrepancies that were not due to differences in lab instrument software and the validator's calculator significant figure/rounding protocols were found.

## 3.3 Field QC Results

No field duplicates or field blanks were collected. However, collocated samples were collected and labeled as GB02-01A-0010 and GB02-01B-0010. Mean TOC results for these two samples were 8,000 and 7,900 mg/kg (1 % RPD). No action was taken to qualify sample data based on the collocated field sample precision.

### **3.4 Data Usability**

All TOC data as reported by EnChem was acceptable for use. TOC data was qualified as estimated with a J code from imprecision between the four replicates, a matrix effect for GB02-12-0010 and for results between the LOD and LOQ.

### **4.0 Percent Solids**

Sediment samples were analyzed by EnChem SOP LAB-16, Revision No. 2, dated May 2001, which is based on Standard Methods for the Examination of Water and Wastewater SM2540G. No significant deviations from the reference method or EnChem SOP was apparent from the documentation reviewed. Sediment samples were analyzed within the QAPjP Table 5-4 holding times. All lab duplicate RPDs were within the 14 % lab limit, and the collocated sample results were 73.5 and 71.4 %solids (3 % RPD). No action was needed to qualify sample data.

If you have any questions regarding the qualification of data or the data validation process/criteria used, please contact me at (920) 469-9113.

Attachments:

Validated Data Sheets-hard copy

Validated file: VALLENCHEMRESULTS.xls

Table 1 Fox River RMFS Sample Data Validated -October 10, 2002 Technical Memorandum

LAB(S)	SDG#	Matrix	Field Sample ID	Field Collection Date	Lab sample ID	PCBs	TOC	%solids
Enchem	922546A	sediment	GB02-01B-1030	23-Jul-02	922531-040	x	x	x
Enchem	922546A	sediment	GB02-18-0010	23-Jul-02	922531-050	x	x	x
Enchem	922546A	sediment	GB02-18-1034	23-Jul-02	922531-051	x	x	x
Enchem	922546A	sediment	GB02-32-0009	24-Jul-02	922546-001	x	x	x
Enchem	922546A	sediment	GB02-26-0007	24-Jul-02	922546-002	x	x	x
Enchem	922546A	sediment	GB02-19-0010	24-Jul-02	922546-003	x	x	x
Enchem	922546A	sediment	GB02-19-1035	24-Jul-02	922546-004	x	x	x
Enchem	922546A	sediment	GB02-20-0010	24-Jul-02	922546-005	x	x	x
Enchem	922546A	sediment	GB02-20-1030	24-Jul-02	922546-006	x	x	x
Enchem	922546A	sediment	GB02-20-3047	24-Jul-02	922546-007	x	x	x
Enchem	922546A	sediment	GB02-02-0010	24-Jul-02	922546-008	x	x	x
Enchem	922546A	sediment	GB02-02-1030	24-Jul-02	922546-009	x	x	x
Enchem	922546A	sediment	GB02-02-3051	24-Jul-02	922546-010	x	x	x
Enchem	922546A	sediment	GB02-22-0007	24-Jul-02	922546-011	x	x	x
Enchem	922546A	sediment	GB02-22-0718	24-Jul-02	922546-012	x	x	x
Enchem	922546A	sediment	GB02-31-0010	24-Jul-02	922546-013	x	x	x
Enchem	922546A	sediment	GB02-31-1030	24-Jul-02	922546-014	x	x	x
Enchem	922546A	sediment	GB02-31-3046	24-Jul-02	922546-015	x	x	x
Enchem	922546A	sediment	GB02-21A-0010	24-Jul-02	922546-016	x	x	x
Enchem	922546A	sediment	GB02-21A-1030	24-Jul-02	922546-017	x	x	x
Enchem	922546B	sediment	GB02-01B-3043	23-Jul-02	922531-041	x	x	x
Enchem	922546B	sediment	GB02-21A-3057	24-Jul-02	922546-018	x	x	x
Enchem	922546B	sediment	GB02-21B-0010	24-Jul-02	922546-019	x	x	x
Enchem	922546B	sediment	GB02-21B-1030	24-Jul-02	922546-020	x	x	x
Enchem	922546B	sediment	GB02-15-0010	24-Jul-02	922546-021	x	x	x
Enchem	922546B	sediment	GB02-15-1030	24-Jul-02	922546-022	x	x	x
Enchem	922546B	sediment	GB02-15-3040	24-Jul-02	922546-023	x	x	x
Enchem	922546B	sediment	GB02-14-0010	24-Jul-02	922546-024	x	x	x
Enchem	922546B	sediment	GB02-14-1026	24-Jul-02	922546-025	x	x	x
Enchem	922546B	sediment	GB02-14-2836	24-Jul-02	922546-026	x	x	x
Enchem	922546B	sediment	GB02-27-0010	24-Jul-02	922546-027	x	x	x
Enchem	922546B	sediment	GB02-27-1030	24-Jul-02	922546-028	x	x	x
Enchem	922546B	sediment	GB02-27-3040	24-Jul-02	922546-029	x	x	x
Enchem	922546B	sediment	GB02-28-0010	24-Jul-02	922546-030	x	x	x
Enchem	922546B	sediment	GB02-28-1030	24-Jul-02	922546-031	x	x	x
Enchem	922546B	sediment	GB02-28-3038	24-Jul-02	922546-032	x	x	x
Enchem	922546B	sediment	GB02-24-0010	24-Jul-02	922546-033	x	x	x
Enchem	922546B	sediment	GB02-24-1030	24-Jul-02	922546-034	x	x	x
Enchem	922546B	sediment	GB02-24-3047	24-Jul-02	922546-035	x	x	x
Enchem	922546B	sediment	GB02-23-0010	25-Jul-02	922546-036	x	x	x
Enchem	922546C	sediment	GB02-23-1018	25-Jul-02	922546-037	x	x	x
Enchem	922546C	sediment	GB02-08-0010	25-Jul-02	922546-038	x	x	x
Enchem	922546C	sediment	GB02-08-1030	25-Jul-02	922546-039	x	x	x
Enchem	922546C	sediment	GB02-08-3055	25-Jul-02	922546-040	x	x	x
Enchem	922546C	sediment	GB02-09-0010	25-Jul-02	922546-041	x	x	x
Enchem	922546C	sediment	GB02-09-1030	25-Jul-02	922546-042	x	x	x
Enchem	922546C	sediment	GB02-09-3038	25-Jul-02	922546-043	x	x	x
Enchem	922546C	sediment	GB02-13-0010	25-Jul-02	922546-044	x	x	x
Enchem	922546C	sediment	GB02-13-1029	25-Jul-02	922546-045	x	x	x
Enchem	922546C	sediment	GB02-30-0010	25-Jul-02	922546-046	x	x	x
Enchem	922546D	sediment	GB02-30-1030	25-Jul-02	922546-049	x	x	x
Enchem	922546D	sediment	GB02-30-3037	25-Jul-02	922546-052	x	x	x
Enchem	922546D	sediment	GB02-07-0010	25-Jul-02	922546-053	x	x	x
Enchem	922546D	sediment	GB02-07-1030	25-Jul-02	922546-054	x	x	x
Enchem	922546D	sediment	GB02-07-3038	25-Jul-02	922546-055	x	x	x
Enchem	922546D	sediment	GB02-10-0010	25-Jul-02	922546-056	x	x	x
Enchem	922546D	sediment	GB02-10-1030	25-Jul-02	922546-057	x	x	x
Enchem	922546D	sediment	GB02-10-3044	25-Jul-02	922546-058	x	x	x
Enchem	922546D	sediment	GB02-29-0010	25-Jul-02	922546-059	x	x	x
Enchem	922546D	sediment	GB02-29-1030	25-Jul-02	922546-060	x	x	x
Enchem	922546D	sediment	GB02-29-3064	25-Jul-02	922546-061	x	x	x
Enchem	922546D	sediment	RI-02-B	9-Jul-02	922546-062	x	x	x
Enchem	922546D	sediment	RI-02-A	9-Jul-02	922546-063	x	x	x

Table 1 Fox River RI/FS Sample Data Validated -October 10, 2002 Technical Memorandum

LAB(S)	SDG#	Matrix	Field Sample ID	Field Collection Date	Lab sample ID	PCBs	TOC	%solids
Enchem	922531A	sediment	GB02-03-0010	22-Jul-02	922531-001	x	x	x
Enchem	922531A	sediment	GB02-03-1030	22-Jul-02	922531-002	x	x	x
Enchem	922531A	sediment	GB02-03-3040	22-Jul-02	922531-003	x	x	x
Enchem	922531A	sediment	GB02-34-0010	22-Jul-02	922531-004	x	x	x
Enchem	922531A	sediment	GB02-34-1030	22-Jul-02	922531-006	x	x	x
Enchem	922531A	sediment	GB02-34-3040	22-Jul-02	922531-006	x	x	x
Enchem	922531A	sediment	GB02-33-0010	22-Jul-02	922531-007	x	x	x
Enchem	922531A	sediment	GB02-33-1030	22-Jul-02	922531-008	x	x	x
Enchem	922531A	sediment	GB02-33-3094	22-Jul-02	922531-009	x	x	x
Enchem	922531A	sediment	GB02-04-0010	22-Jul-02	922531-010	x	x	x
Enchem	922531A	sediment	GB02-04-1030	22-Jul-02	922531-011	x	x	x
Enchem	922531A	sediment	GB02-04-3084	22-Jul-02	922531-012	x	x	x
Enchem	922531A	sediment	GB02-11-0010	22-Jul-02	922531-013	x	x	x
Enchem	922531A	sediment	GB02-11-1024	22-Jul-02	922531-014	x	x	x
Enchem	922531A	sediment	GB02-16-0010	22-Jul-02	922531-015	x	x	x
Enchem	922531A	sediment	GB02-16-1023	22-Jul-02	922531-016	x	x	x
Enchem	922531A	sediment	GB02-25-0010	22-Jul-02	922531-017	x	x	x
Enchem	922531A	sediment	GB02-25-1030	22-Jul-02	922531-018	x	x	x
Enchem	922531A	sediment	GB02-25-3045	22-Jul-02	922531-019	x	x	x
Enchem	922531A	sediment	GB02-12-0010	22-Jul-02	922531-020	x	x	x
Enchem	922531B	sediment	GB02-12-1035	22-Jul-02	922531-021	x	x	x
Enchem	922531B	sediment	GB02-36-0010	22-Jul-02	922531-022	x	x	x
Enchem	922531B	sediment	GB02-36-1030	22-Jul-02	922531-023	x	x	x
Enchem	922531B	sediment	GB02-36-3066	22-Jul-02	922531-024	x	x	x
Enchem	922531B	sediment	GB02-05-0010	22-Jul-02	922531-025	x	x	x
Enchem	922531B	sediment	GB02-06-1030	22-Jul-02	922531-026	x	x	x
Enchem	922531B	sediment	GB02-05-3069	22-Jul-02	922531-027	x	x	x
Enchem	922531B	sediment	GB02-06-0010	23-Jul-02	922531-030	x	x	x
Enchem	922531B	sediment	GB02-06-1036	23-Jul-02	922531-032	x	x	x
Enchem	922531B	sediment	GB02-37-0010	23-Jul-02	922531-033	x	x	x
Enchem	922531B	sediment	GB02-37-1030	23-Jul-02	922531-034	x	x	x
Enchem	922531B	sediment	GB02-37-3053	23-Jul-02	922531-035	x	x	x
Enchem	922531B	sediment	GB02-01A-0010	23-Jul-02	922531-036	x	x	x
Enchem	922531B	sediment	GB02-01A-1030	23-Jul-02	922531-037	x	x	x
Enchem	922531B	sediment	GB02-01A-3069	23-Jul-02	922531-038	x	x	x
Enchem	922531B	sediment	GB02-01B-0010	23-Jul-02	922531-039	x	x	x
Enchem	922531B	sediment	GB02-17-0010	23-Jul-02	922531-042	x	x	x
Enchem	922531B	sediment	GB02-17-1024	23-Jul-02	922531-043	x	x	x

Table 2 TOC Quadruplates Exceeding 20 %RSD-Green Bay Sediments

SAMPLE ID GB02-	%RSD	SAMPLE ID GB02-	%RSD
03-0010	29	22-0718	38
03-1030	60	31-0010	48
34-3040	38	31-3046	24
04-1030	21	21A-3057	51
04-3084	50	21B-1030	44
36-0010	24	15-1030	22
36-1030	61	14-1028	56
06-1036	36	28-1030	34
37-0010	33	24-0010	27
01A-0010	36	23-0010	37
01A-1030	22	23-1018	39
01B-0010	29	08-1030	24
18-0010	143	08-3055	35
01B-1030	102	09-1030	39
19-0010	34	30-3037	42
19-1035	41	07-0010	25
20-0010	24	07-3038	25
20-1030	31	10-0010	46
02-0010	31	10-1030	29
02-1030	29	29-0010	26
22-0007	59		

VALIDATED DATA SHEETS REFERRED TO  
IN DATA VALIDATION REPORT ONLY  
AVAILABLE IN HARDCOPY DOCUMENT

**APPENDIX D**  
**CQM REPORT**

**Not available for electronic version of report.**